AN ARGUS SPECIALIST PUBLICATION

May 1986

£1.00

Your COMMODORE

YOUR BEST INDEPENDENT COMMODORE MAGAZINE

Now Incorporating

YOUR 64



CREATE YOUR OWN NIGHTMARES WITH ADVENTURAID

C-16/PLUS-4: SOUND SYNTHESISER

C64 WORD PROCESSOR

WIN A ROBOTIX R4000 KIT

MAY 1986

VOLUME 2
NUMBER 8

Editor:
Stuart Cooke

Assistant Editor:
Marie Curry

Advertisement Manager:
Mike Segrue

Advertisement Copy Control:
Laura Champion

Group Editor:
Dave Bradshaw

Group Managing Editor:
Wendy Palmer

Managing Director:
Peter Welham

Origination:
Ebony Typesetting

Design:
Argus Design

Editorial & Advertisement Office
No 1 Golden Square,
London W1R 3AB.
Telephone: 01-437 0626
Telex: 8811896

Your Commodore is a monthly magazine appearing on the first Friday of each month.

Distribution by: Argus Press Sales & Distribution Ltd. 12-18 Paul Street, London EC2A 4JS. Printed by: Alabaster Passmore & Sons Ltd, Tovil, Maidstone, Kent.

Subscription rates upon application to Your Commodore Subscriptions Department, Infonet Ltd, Times House, 179 The Marlowes, Hemel Hempstead, Herts. HP1 1BB.

CONTENTS

FEATURES

SERIES

REGULARS

COMPETITION

DATA STATEMENTS

Soft in the Head

The software scene this month is as crowded and diverse as ever.

Plunging straight in at the deep end with the serious stuff we have four new productivity programs from Ariolasoft, all brought in from across the Atlantic.

PaperClip, HomePak and The Consultant are all from the Canadian software house, Batteries Included.

PaperClip is a word processor and it's a former number one piece of software in the States. Ariolasoft describes it as professional and comprehensive and it features full screen editing. It's available on disk and side two contains an enhanced C128 version.

HomePak is a three module package and includes: HomeText a word processor; HomeFind, a data manager; and HomeTerm a telecommunications program which communicates with databases and other computers.

The Consultant is a database management system designed to organise, sort and retrieve records, find exact items and execute a variety of search and analysis procedures.

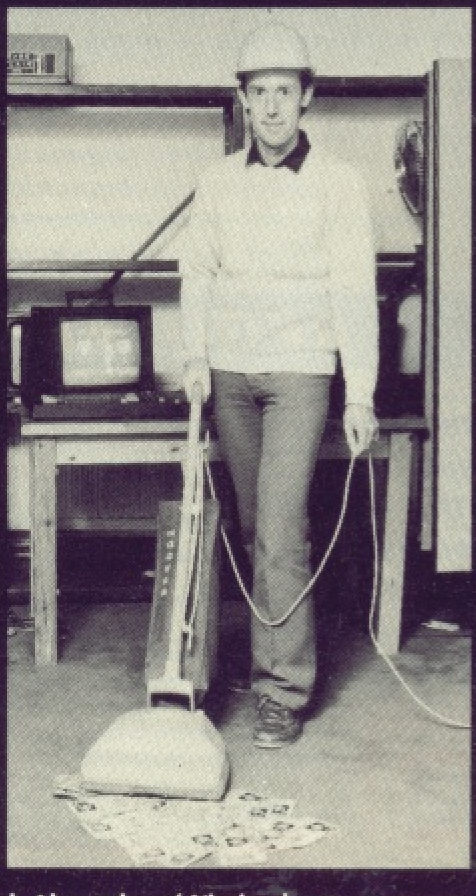
The final package in the latest batch of launches from Ariolasoft is called Cut and Paste. It's an easy to use word processor from Electronic Arts and its features include automatic word wrap, dynamic menus and full cut and paste editing.

Ariolasoft's Ashley Gray said: "Ariolasoft has taken great care to ensure that these new productivity titles are exactly right for the home and small business user, both in terms of program quality, price and distinctive UK packaging."

Commodore is also launching new products for the serious user. Two new music systems were due to be launched at the Ideal Home Exhibition as we went to press. They are a complete Music System including a Commodore 64 for under £330 and a Music Expansion system for under £150.

Staying with the more serious aspects of a Commodore user's life, Medstat, a Nottingham based software house, is promoting its range of exam revision software as we come around once more to the time of 'O' and 'A' Levels. The revision aid programs cover French, German, Spanish and Italian CSE, 'O' and 'A' level examinations and concentrate on verb and vocabulary learning. Prices start at £13.95 and they are all available on the C64.





Nick Alexander of Virgin cleans up soccer

Now to games. Fans of the Rocky Horror Show who also own a C128 will be pleased to hear that CRL is to bring out an all new version of its Rocky Horror game specially for the 128. Redefined graphics, brand new sprites, new animation and even more locations are promised together with some stunning effects. No price has yet been announced for the game but it should be available in May.

There's also good news from CRL for C-16 and Plus/4 owners. The Berks trilogy is now available on one cassette priced at £6.95. It features the original game, Berks plus Major Blink (Berks 2) and Berks 3 an arcade adventure in which you finally penetrate the Berks city and steal their treasure.

Virgin has recently launched the official Football Association soccer game — FA Cup Football. The game is mainly text based and places you in the difficult position of managing your teams through all the rounds of the FA Cup.

Tony Williams, author of the League Club Directory, upon whose extensive research t he game is based, said: "The FA Cup is football's most exciting competition and this game reflects that excitement. We've had a great deal of fun

putting it together and I'm sure people will have as much fun playing it." It cost £7.95 on the C64.

Imagine has entered the Kung Fu games market with a new release called Yie Ar Kung Fu — a very violent game by the sound of it! Set in Japan, you take the part of Oolong who is attempting to become a Kung Fu grandmaster in order to honour the memory of his late, dear-departed father. Success depends on mastering the technique of the 16 different kicks and punches. You've got 10 opponents to beat and when you've knocked out Blues, the resident Grandmaster then the title is yours.

There are two imminent C64 releases from Ocean. Green Beret, a contemporary war drama from Konami — makers of coin-op arcade games — is due for release in May at £8.95. There is also to be a computer game based on that good ol superhero Batman which is scheduled for a May launch and will retail again at £8.95.

For those who would rather have the satisfaction of creating their own programs without a lot of sweat, there is a new Graphic Adventre Creator for the C64/128 from Incentive Software. It is an adventure generator with a built in graphics editor and Incentive claims that it allows you to produce professional adventures with ease and does not require any knowledge of computer programming. It's due for release on 1 May.

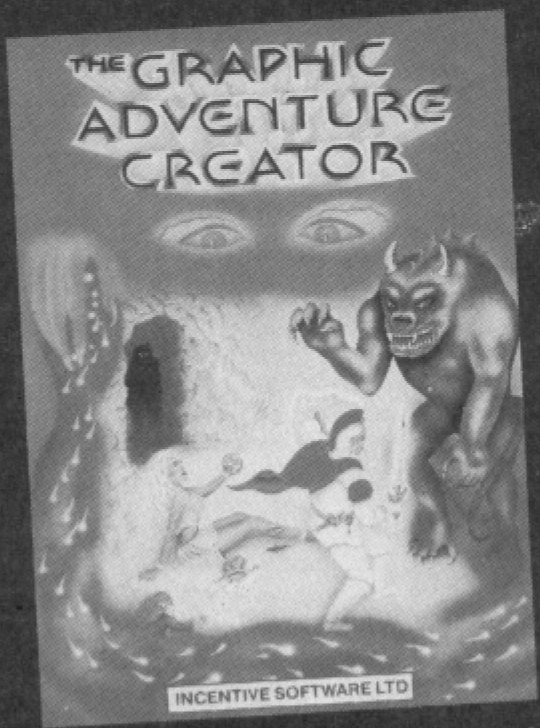
In the shops now should be Micro Power's Doctor Who game, which has been in the pipeline for many months. The game contains about 130 screens and has three different tunes to keep you amused while you tackle the problems it represents. One of these is, of course the classic Doctor Who theme. the price — £11.95. Oh, and look out for the programmable droid cat. The what?

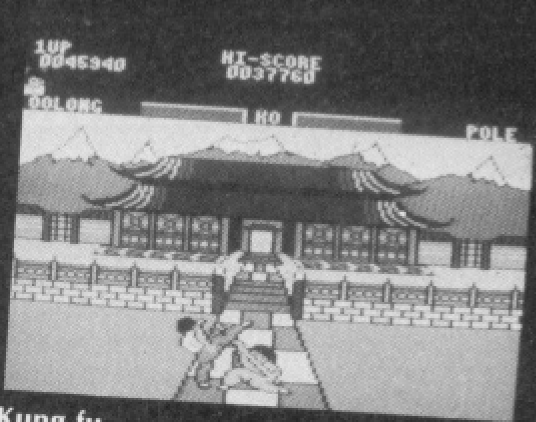
If you want to be king of the gnomes, or you just want to find out a bit about the intricacies of gnome culture then US Gold's Time Tunnel might be the game for you. You have been chosen as the next gnome king but you need to complete the inevitable tasks to prove your worth. An ancient gnome manuscript has been ripped up and scattered through the ages by an evil cyclops — a weird mix of Scandinavian and Greek folklore! When you've got the seven pieces you can perform the magic spell which will free all the gnomes in the forests of Scandinavia and allow you to become their supreme leader. It's £6.95 on cassette and £14.95 on disk.

Yet another well known hero has been transferred to the big screen and thence to the computer monitor. This time it's Biggles and Mirrorsoft has acquired the rights to produce the game of the film of the books. It should be out at the beginning of May so budding air aces watch out for it.



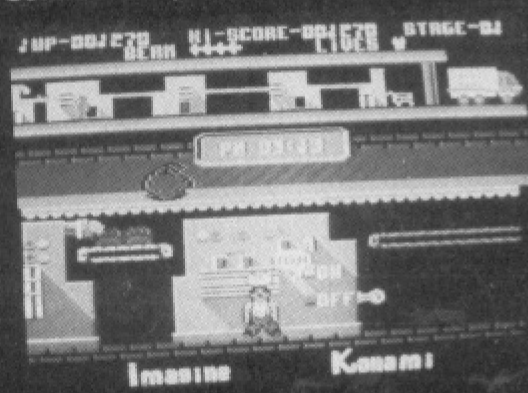
Mind Games joins the Force





Kung fu

Comic Bakery



Moving from the air right down to earth into the realms of the ludicrous you come to a new release from Imagine called Comic Bakery. You are Joe the baker in charge of your high tech loaf producing plant, and you must stop the scavenging raccoon dogs eating all the loaves. It's in the shops now at £8.95 on cassette.

If you've always wanted to find out what it's like to be one of the boys in blue in a city police force then maybe Mind Games latest offering will give you some idea of what it's like. Allegedly produced in consultation with some of "Britain's top policemen" it's a complicated game which requires you to keep law and order without losing your popularity. Impossible? Try it and see. It's £9.95 and patrolling the streets now.

For C-16 owners there is now a version of Elite's very popular title Commando. Originally an arcade coin-op game it has been available for the C64 for some time. Now C-16 users can have a taste of excitement themselves.

Touch Line

Ariolasoft: 8 Westminster Palace Gardens, Artillery Row, London SW1. 01 222 0833.
US Gold. Unit 10, The Parkway Industrial Centre, Heaneage Street, Birmingham. 021 359 3020.
Elite Systems: Anchor House, Anchor Road, Aldrige, Walsall WS9 8PW. 0992 55852.
Mind Game: Liberty House, 222 Regent Street, London W1R 7DB. 01 439 0666.
Imagine: 6 Central Street, Manchester M2 5NS. 061 834 3939.
Micro Power: Northwood House, North Street, Leeds LS7 2AA. 0532 458800.
Incentive: 54 London Street, Reading, Berks RG1 4SQ. 0734 591678.
Ocean: As Imagine.
Virgin: 2-4 Vernon Yard, Portobello Road, London W11 2DX. 01 727 8070.
CRL: CRL House, 9 King's Yard, Carpenter's Road, London E15 2HD. 01 533 2918.
Medstat: City House, Maid Marion Way, Nottingham NG1 6BH. 0602 411120.
Commodore: 1 Hunter's Road, Weldon, Corby, Northants NN17 1QX. 0536 205555.



The Commodore holiday offer

Generally Speaking

A plug-in adaptor to get rid of mains interference is now available from Duraplug. It fits directly into a standard socket and provides a continuous laundering of the electrical supply to a plugged in appliance.

Computers are apt to suffer from voltage surges and the adaptor will clean this up so that your printer won't print weird gobbledegook.

It's available from high street shops for £17.90.

Another of the smaller software houses in this country has joined together with one of the big boys to make distribution faster and more reliable.

English Software has signed an agreement with US Gold to make the American firm and sole distributor of English Software's new products. If you've ever had any trouble getting hold of the latest English Software then perhaps it will be easier from now on.

If you live in London or you come to town to do the occasional bit of shopping or business then you might like to pay a visit to the Commodore centre at Gultronic in Tottenham Court Road.

Gultronic decided to open the centre to meet a growing demand for Commodore products. Gultronic's Sam Tulsiani said: "The Christmas season was very buoyant this year and our major problems were supply and not demand. Commodore products are of a high standard with a good range and the company is stable, that is why we decided to invest in the centre."

He continued: "We are convinced there is a good future in the home computer market as long as people put themselves behind the products.

Following last month's mention of CRL's new label we now have some more information on the subject. A company spokesman said: "Nu Wave has been developed for the computer user who has grown tired of the traditional arcade game and adventure game and is looking for a refreshing altenative. We are confident that Nu Wave will make a great impact on the software market in 1986."

There are no Commodore programs available on the Nu Wave label at the moment but look out for it in the near future.

Hard Lines

Miracle Technology has just launched the new 64 Multimodem. It gives access to not only Prestel, Micronet, Microlink and viewdata services but also to databases, bulletin boards, electronic mail, telex and user-user communications.

The 64 Multimodem is a complete data comms solution — autoanswer, autodial on it has all software on board in ROM. It is menu-driven and multi-speed and supports CCITT V21/23 and Bell 103 standards handling baud rates of 300/300, 1200/75 and 75/1200. Functions include save and print frame, auto mailbox with edit and save and telesoftware downloading.

The cost of the new modem is £98.50 (£116.15 including VAT and UK delivery).

Commodore is running another holiday offer with purchases of new computers. The Commodore 64 compendium and the new 128 are just two products which come complete with up to £250 off a holiday for two.

The offer is valid on a full range of Commodore peripherals including the 64 Compendium, Commodore 128, disk drives, monitors and printers.

Each product contains five £50 vouchers which are redeemable against a variety of holiday from leading tour operators from Club 18-30 to CTC cruises.

Commodore's Chris Kaday said: "Our unique holiday offer last year was an enormous success, so 'Passport to Pleasure' is really a variation on a proven theme. Our retailers are absolutely delighted and so, we believe, are our customers. It just goes to show what a little imagination and creativity can do in a so-called shrinking market."

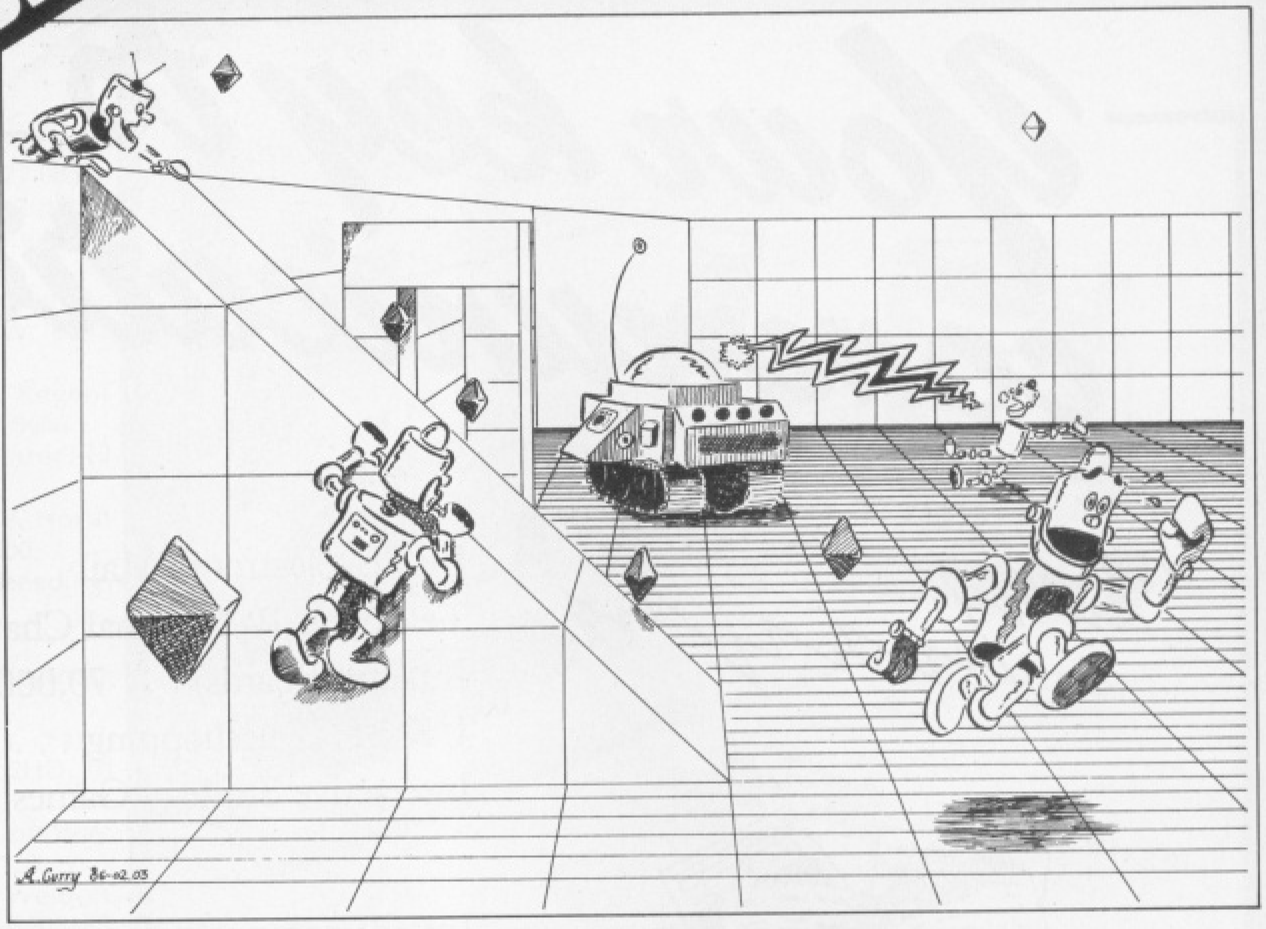
The vouchers are valid on any holiday taken before the end of October 1987.

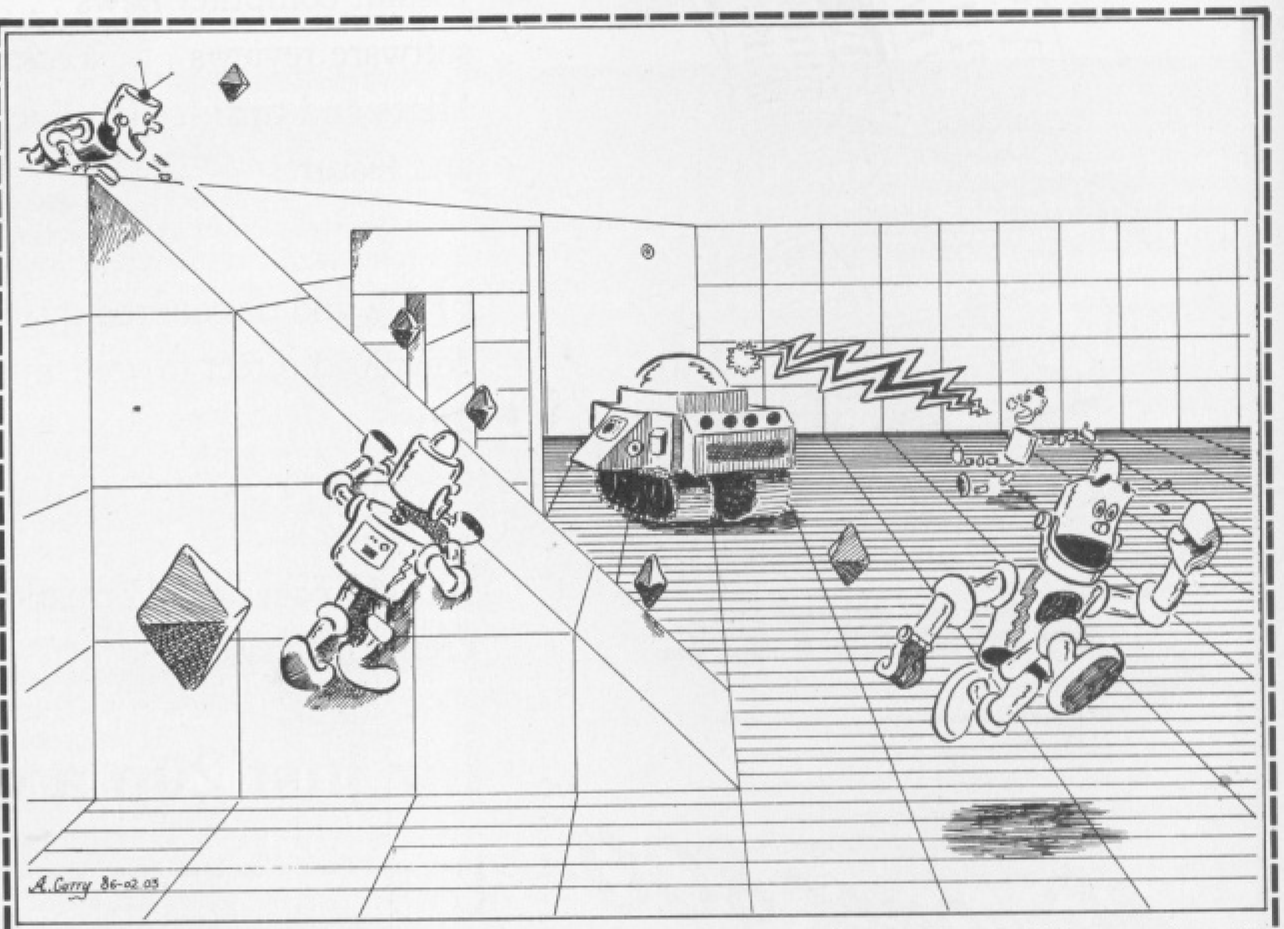
Touch Line

Miracle Technology: St Peters Street, Ipswich IP1 1XB
CRL: CRL House, 9 King's Yard, Carpenter's Road, London E15 2HD. 01 533 2918.

COMPETITION

This month CRL and Your Commodore offer you the chance to build your own robot in our Berks competition.





If you used to have a Meccano kit when you were knee high to a grasshopper then you'll probably be very interested in this month's prize. We got together with CRL to offer you, as first prize, a Robotrix Master Set. You can use it to build your own robots and you can even make them mobile because there are four motors included.

The runners-up prizes will be especially attractive to our rapidly growing number of C-16 and Plus/4 readers. There are 25 copies of the Berks Trilogy from CRL.

How to Enter

Study the two cartoons. There are a number of differences between them. Mark the differences which you find on the cartoon attached to the entry coupon. Fill in the coupon clearly and carefully and seal it in an envelope. Write your answer on the back of the envelope and send it to: CRL Competition, Your Commodore, No 1 Golden Square, London W1R 3AB. Closing date: Friday 30 May, 1986.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications, CRL and Alabaster Passmore and Sons. This restriction also applies to employee's families and agents of the company.

The How to Enter section forms part of the rules. The editor's decision is final and no correspondence will be entered into.

CRL Competition Entry Form

Name ....

Address ....

....

....

post code

Number of differences found

Send your entry to: CRL Competition, Your Commodore, No 1 Golden Square, London W1R 3AB.
Closing date: Friday 30 May, 1986.
Don't forget to write your entry on the back of your envelope.


DO YOU WANT TO BE A HERO?
Biggles
The result of unique co-operation between three ace software developers and the Biggles film production company, Biggles – The Untold Story will knock you right out of the air! It's a multi-part arcade strategy game in which each part must be completed to reach your final goal.
In the air, on the rooftops, on the ground, or in the trenches
YOU CAN BE A HERO!
Coming in May
Commodore 64
£9.95 tape, £12.95 disk
Spectrum 48K
£9.95 tape
Coming in June
Amstrad CPC
£9.95 tape, £14.95 disk
MIRRORSOFT
Purnell Book Centre, Paulton, Bristol BS18 5LQ

SPRITE IDEAS

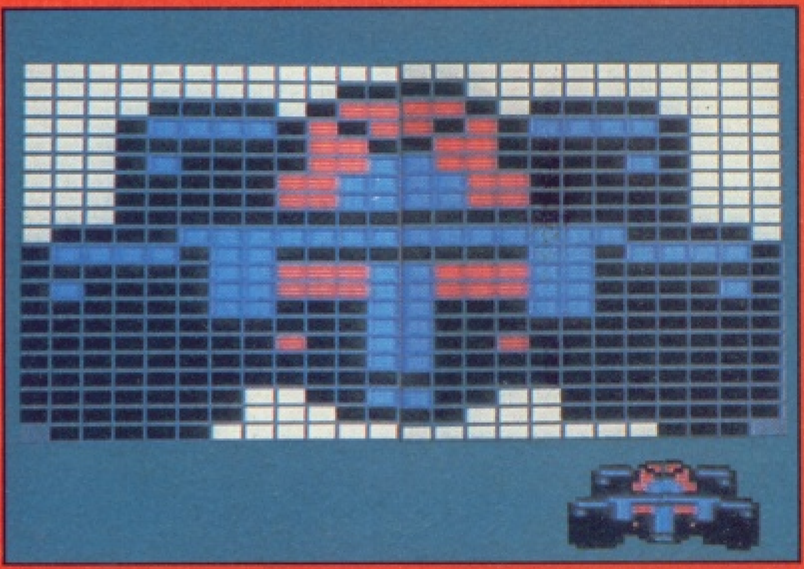
When you are designing a game one of the longest jobs is designing the sprites. If you are good at art then fine, if not your next monster will probably end up looking like a square box with legs.

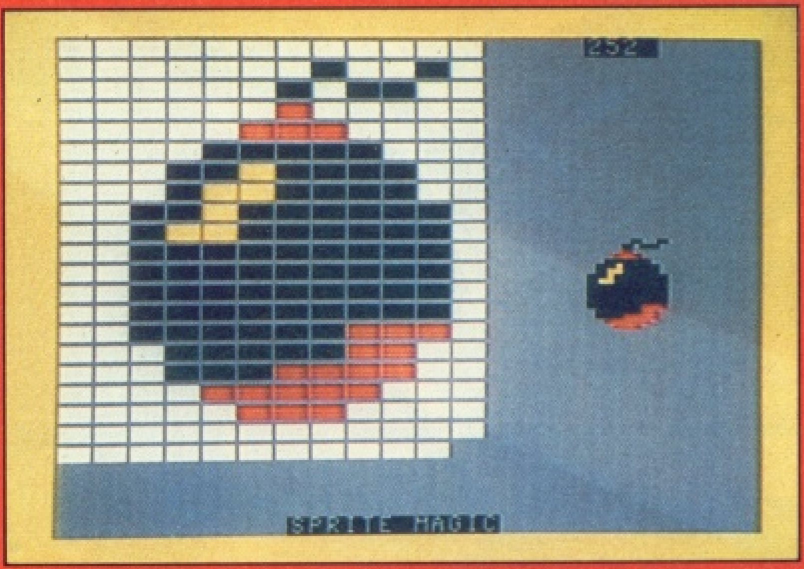
Now, Your Commodore comes to the rescue once again with Sprite Ideas. If you have designed any sprites for games and you don't mind other people seeing your masterworks then why not send them into us. Each month we will be offering £10 for the best entries.

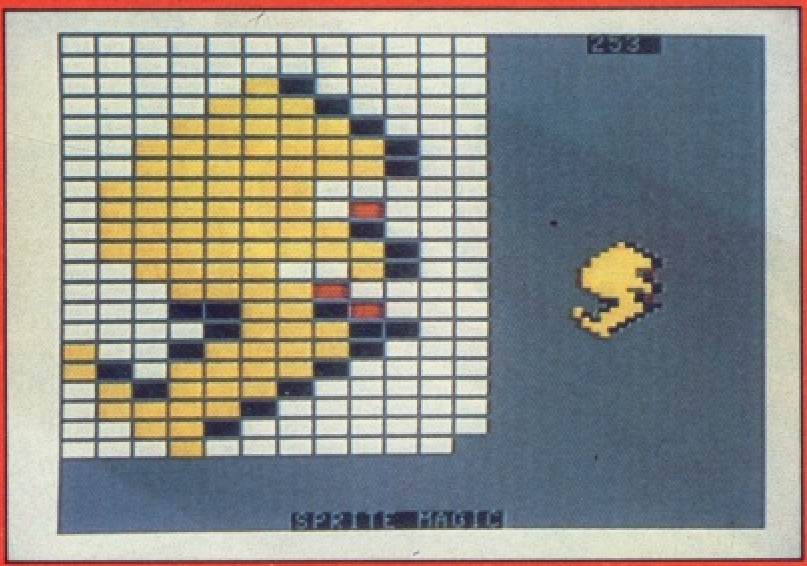
Your sprites can be anything at all (within reason), if you've designed a series of animated characters then send in the lot. We'd love to have a look at them.

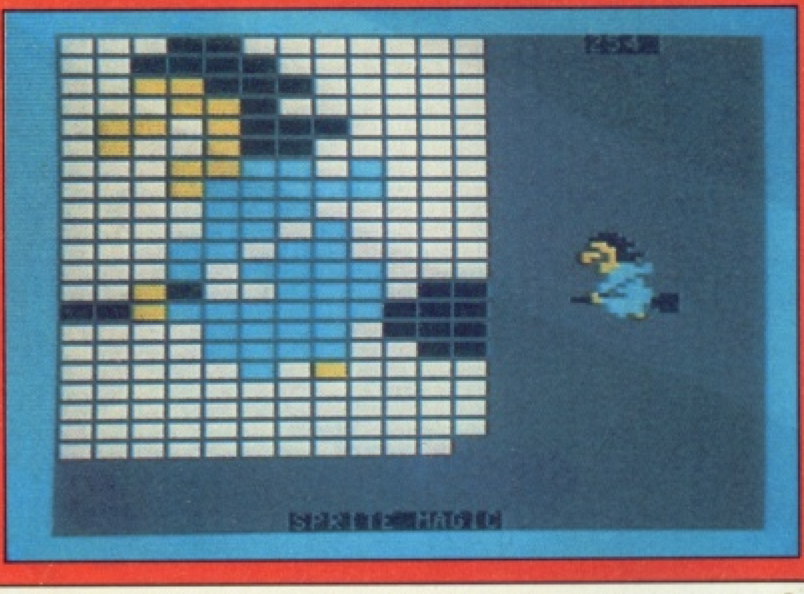
So, next time you are after an Ogre to put in your new game, have a look in this section of the magazine and you may find just what you are looking for.

This month's sprites are all by Kevin Peppin from Little Neston, South Wirral.

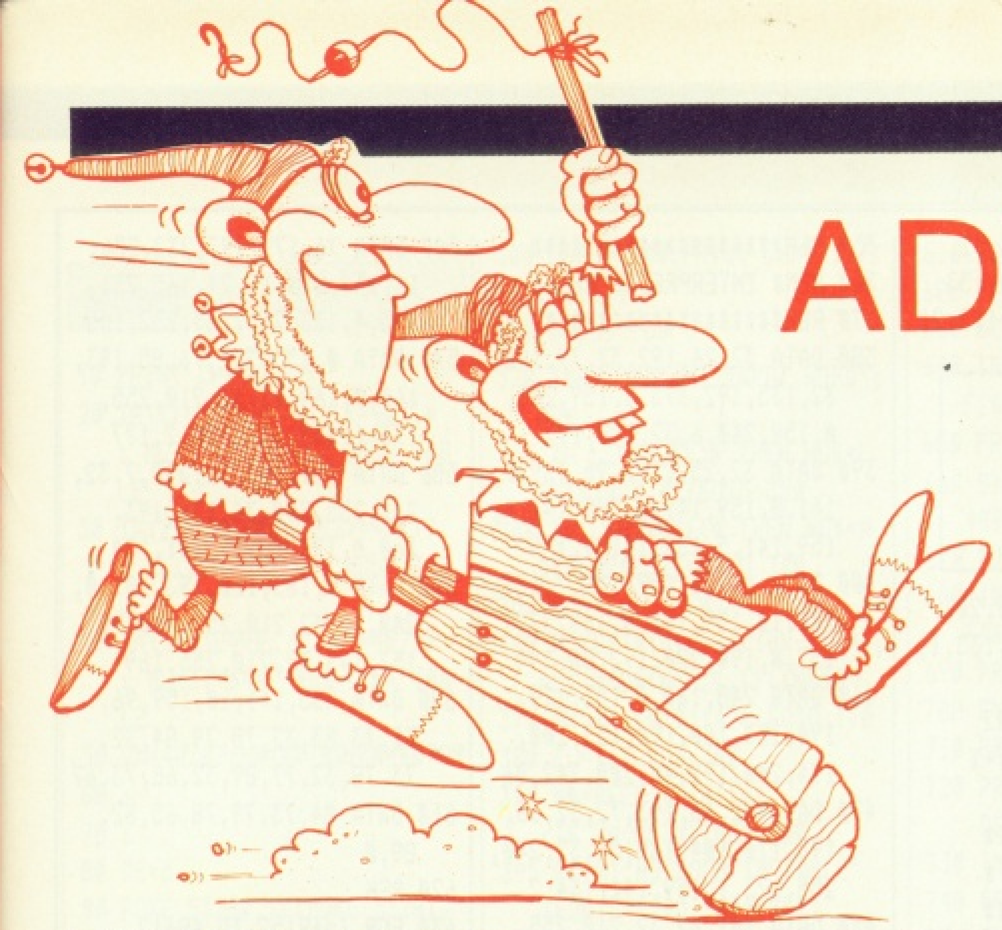









```
100 : RACING CAR ( LEFT )
101 DATA000,000,000,000,000,015,000,255
102 DATA058,003,085,238,003,255,235,003
103 DATA127,233,003,255,165,003,255,165
104 DATA003,255,255,063,213,085,213,117
105 DATA255,255,245,169,223,245,169,255
106 DATA245,253,255,255,253,255,255,189
107 DATA255,255,253,255,255,255,255,252
108 DATA061,255,252,015,063,240,000,000
109 : RACING CAR ( RIGHT )
110 DATA000,000,000,240,000,000,172,255
111 DATA000,187,085,192,235,255,192,107
112 DATA253,192,090,255,192,090,255,192
113 DATA255,255,192,085,087,252,255,093
114 DATA087,106,095,255,106,095,247,127
115 DATA095,255,127,255,255,126,255,255
116 DATA127,255,255,255,255,255,124,063
117 DATA255,240,063,255,000,015,252,000
118 : BOMB
119 DATA000,000,000,000,001,004,000,004
120 DATA080,000,012,000,000,063,000,000
121 DATA085,064,001,101,080,001,165,080
122 DATA005,149,084,006,149,084,005,085
123 DATA084,005,085,084,005,085,084,005
124 DATA085,084,005,085,252,001,085,240
125 DATA001,095,240,000,255,192,000,063
126 DATA000,000,000,000,000,000,000,000
127 : GHOST
128 DATA000,000,000,000,000,000,000,052
129 DATA000,000,253,000,003,255,064,015
130 DATA255,208,015,255,208,063,252,000
131 DATA063,252,128,063,255,064,063,255
132 DATA208,015,240,208,003,254,000,001
133 DATA125,128,000,127,080,193,255,064
134 DATA211,253,000,055,244,000,063,208
135 DATA000,015,064,000,003,000,000,000
136 : WITCH
137 DATA003,192,000,015,240,000,010,252
138 DATA000,002,176,000,040,191,000,032
139 DATA188,000,002,148,064,002,085,064
140 DATA000,084,000,000,081,000,001,069
141 DATA000,001,021,064,011,005,079,249
142 DATA085,127,000,085,063,000,085,015
143 DATA000,018,000,000,000,000,000,000
144 DATA000,000,000,000,000,000,000,000
```



ADVENTURE AID

Allen Webb comes to the rescue of budding adventure programmers.

IN MY SHORT ADVENTURE series last year, I suggested a number of ways of saving memory when writing adventures. In this article, I will describe some machine code routines which will actually do the job for you. Since each routine requires a set of data tables, I have written three editors in Basic which will allow you to create the necessary data bases.

There are three areas for real saving:

1. The interpretor
2. The storage of text
3. The storage of objects

In order to offer the largest possible portion of RAM for Basic, I have used the area behind the ROMs. The memory map of the system, assuming that you use all three routines, is:

\$8600-\$95FF	Object descriptions
\$9600-\$96FF	Link word table
\$9700-\$9AFF	Verb table
\$9B00-\$9EFF	Noun table
\$9F00-\$9FFF	Text work area
\$A000-\$BFFF	Lower text area
\$C000-\$C1BE	Interpretor
\$C200-\$C2FF	Buffer
\$C900-\$C9B9	Object manipulation code
\$C400-\$C4FF	Object location table
\$CB00-\$CCFF	Low area tables
\$CD00-\$CEFF	High area tables
\$CF00-\$CFFF	Buffer
\$E000-\$FFFF	High text area.

PROGRAM: EXAMPLE

```
10 POKE 56,134: CLR
20 SYS 679,"OBJECTS",8,34304
30 SYS 679,"OBJECTS.T",8,
   50176
40 SYS 679,"VOCABULARY",8,
   38400
45 SYS 679,"TEXT",8,40960
46 SYS 679,"TEXT.T",8,51968
50 POKE 40705,0:POKE 40706,6
   :POKE 53281,15
   :POKE 53280,15
   :PRINT CHR$(147):LO=1
55 GOSUB 150
60 SYS 49152,0,21
70 IF PEEK(40714)=255 THEN 1
   00
80 VE=PEEK(40711)
   : OB=PEEK(40712)-1
   : LI=PEEK(40713)
90 ON VE GOSUB 120,150,190,
   230
100 POKE 781,21: POKE 782,0
   : POKE 783,0: SYS 65520
110 PRINT"[SPC39]":GOTO 60
120 REM TAKE
130 IF PEEK(50176+OB)<>LO TH
   EN PRINT CHR$(147)"I CAN'
   T FIND IT":RETURN
140 POKE 50176+OB,255
   : PRINT CHR$(147)"TAKEN"
   :RETURN
150 REM LOOK
155 PRINT CHR$(147)CHR$(31);
   :SYS 51456,LO-1
160 PRINT"I CAN SEE:"CHR$(28)
170 SYS 49920,LO: IF PEEK(50
   103)=255 THEN PRINT"NOTHI
   NG OF VALUE"
180 RETURN
190 REM INVENTORY
200 PRINT CHR$(147)"YOU'RE
   CARRYING"
210 SYS 49920,255
   : IF PEEK(50103)=255 THEN
   PRINT CHR$(28)"NOTHING
   "
220 RETURN
230 REM DROP
240 IF PEEK(50176+OB)<>255 T
   HEN PRINT CHR$(147)"YOU
   DON'T HAVE IT":RETURN
250 POKE 50176+OB,LO
   : PRINT CHR$(147)"DROPPED"
   :RETURN
```

PROGRAM: LOADER

```
10 REM**************
20 REM*[SPC2]PEEKALL[SPC2]*
30 REM**************
40 DATA 32,253,174,32,138,
   173,32,247,183,165,20,164,
   21,133,180,132,181,160,0
50 DATA 169,52,133,1,177,180,
   141,232,3,169,55,133,1,96
60 FOR I=0 TO 32:READ X
   :POKE 50944+I,X:NEXT
70 REM***************
80 REM* SAVE BLOCK *
90 REM***************
100 DATA 32,212,225,32,253,
   174,32,138,173,32,247,183,
   165,20,72,165,21,72,32,253
```

Using this system, you have the following capabilities and limitations:

32255 bytes for Basic useage.
1536 bytes (\$C500-\$CAFF) for other purposes.
Up to:
255 verbs
255 nouns
63 link words
255 objects in any of 255 locations
16382 bytes for use for up to 512 messages or descriptions

Whilst this may not be up to the Quill's standards, it's enough for quite a significant adventure.

The editors use three machine code routines for the loading and saving of data blocks. These are included with the other machine code in Loader 1. I've kept the six blocks of code separate so that you can omit the utilities at a later date. If you choose to use them in your final adventure (certainly SAVE and LOAD), they occupy spare space between the ROMs which is low in memory so that they don't interfere with the main code. I'll discuss these utilities later.

The interpretor is similar to the one in my earlier series but has been rewritten so as to be more compact. It is called by a simple SYS 49152,X,Y. The prompt for input will start at co-ordinates X and Y. The interpretor will accept up to 79 characters and delete is available to correct your input. The text is scanned to extract

the first, second and last words. The first is called the verb, the second the link word and the last the noun. Here are some examples:

Input	Verb	Link word	Noun
look	look	—	—
take sword	take	—	sword
take the big sword	take	the	sword

These words are checked in the vocabulary and you are told if any are not recognised. The positions of found words in the vocabulary are returned in three registers and an error register tells you if the search has shown any unknown words. These registers are:

Verb register — 40711
Noun register — 40712
Link word register — 40713
Error register — 40714 (0=no error, 255=word not recognised)

When using the interpretor, the error register allows you to loop back for a new command if the last one is not understood. The example program given later shows this.

In order to fit the interpretor into your own colour scheme, location 40705 holds the colour of the prompt and 40706 holds the colour of the input command.

Listing 1 gives an editor for the creation of a vocabulary. The editor is menu driven and the functions allow you to create, alter, load and save the vocabulary. There is also an option which allows you to test the interpretor and get to know its operation. The main thing to remember is to erase the tables if you plan to create a new vocabulary. Whilst the editor will accept words of any length, only the first four characters are used. Words shorter than four letters are padded with spaces.

One of the biggest consumers of memory is text. Clever companies such as Level 9 use data compression to fit more in. I will content myself with simply using "unused" RAM. The code provides two commands:

SYS 51456,MN

prints message number MN from the area behind the Basic ROM (the lower text area).

SYS 51459,MN

```
110 DATA 174,32,138,173,32,
   247,183,165,1,41,254,133,
   1,166,20,164,21,104,133,21
120 DATA 104,133,20,169,20,
   32,95,225,165,1,9,1,133,1,
   96
130 FOR I=50688 TO 50742
   :READ X:POKE I,X:T=T+X
   : NEXT
140 REM*******************
150 REM* RELOCATE LOAD *
160 REM*******************
170 DATA 32,253,174,32,158,
   173,32,166,182,141,131,3,
   160,0,177,34,153,60,3,200
180 DATA 204,131,3,208,245,
   32,241,2,165,20,141,130,3,
   32,241,2,165,20,164,21,133
190 DATA 251,132,252,169,1,
   174,130,3,160,0,32,186,
   255,173,131,3,162,60,160,3
200 DATA 32,189,255,169,0,
   166,251,164,252,32,213,
   255,96,32,253,174,32,138,
   173
210 DATA 32,247,183,96,0
220 FOR I=679 TO 763
230 READ X: POKE I,X:NEXT
240 REM**************
250 REM* TEXT M/C[SPC2]*
260 REM**************
270 DATA 76,16,201,76,71,201,
   32,253,174,32,138,173,32,
   247,183,96,32,6,201,164
280 DATA 20,140,68,3,185,0,
   203,133,98,185,0,204,133,
   99,120,165,1,41,254,133,1
290 DATA 160,0,177,98,240,6,
   153,0,207,200,208,246,153,
   0,207,165,1,9,1,133,1,88
300 DATA 169,0,160,207,32,30,
   171,96,32,6,201,164,20.
   140,68,3,185,0,205,133,98
310 DATA 185,0,206,133,99,
   120,165,1,41,253,133,1,
   160,0,177,98,240,6,153,0,
   207
320 DATA 200,208,246,153,0,
   207,165,1,9,2,133,1,88,
   169,0,160,207,32,30,171,96
330 FOR I=51456 TO 51581
340 READ X: POKE I,X:NEXT
350 REM*********************
360 REM* INTERPRETOR M/C *
370 REM*********************
380 DATA 32,24,192,32,79,192,
   32,135,192,173,3,159,205,
   0,159,240,6,32,188,192
390 DATA 32,252,192,96,169,0,
   141,0,159,141,3,159,141,4,
   159,141,5,159,141,9,159
400 DATA 141,8,159,141,7,159,
   141,10,159,160,0,169,32,
   153,0,194,200,192,80,144
410 DATA 248,160,0,153,120,
   194,153,160,194,153,200,
   194,200,192,40,208,242,96
420 DATA 32,66,193,72,32,66,
   193,170,104,168,24,32,240,
   255,173,1,159,141,134,2
430 DATA 169,62,32,210,255,
   173,2,159,141,134,2,160,0,
   32,207,255,201,13,240,7
440 DATA 153,0,194,200,76,
   112,192,169,0,153,0,194,
   140,0,159,96,160,0,185,0,
   194
450 DATA 201,32,240,9,153,
   120,194,200,204,0,159,208,
   240,140,3,159,169,0,133,
   251
460 DATA 169,151,133,252,169,
   120,133,253,169,194,133,
   254,173,12,159,141,11,159
470 DATA 32,78,193,48,4,232,
   142,7,159,96,172,0,159,
   185,0,194,201,32,240,3,136
480 DATA 208,246,200,162,0,
   185,0,194,157,160,194,232,
   200,204,0,159,208,243,142
490 DATA 4,159,169,0,133,251,
   169,155,133,252,169,160,
   133,253,169,194,133,254
500 DATA 173,13,159,141,11,
   159,32,78,193,48,4,232,
   142,8,159,96,24,173,3,159
510 DATA 109,4,159,105,1,205,
   0,159,208,1,96,172,3,159,
   200,162,0,185,0,194,201
520 DATA 32,240,7,157,200,
   194,232,200,208,242,142,5,
   159,169,0,133,251,169,150
530 DATA 133,252,169,200,133,
   253,169,194,133,254,173,
   14,159,141,11,159,32,78
540 DATA 193,48,4,232,142,9,
   159,96,32,253,174,32,138,
   173,32,247,183,165,20,96
550 DATA 169,0,162,0,141,10,
   159,160,0,177,253,209,251,
   208,8,200,192,4,208,245
560 DATA 76,179,193,232,236,
   11,159,240,16,24,165,251,
   105,4,133,251,165,252,105
570 DATA 0,133,252,76,85,193,
   160,0,169,13,32,210,255,
   173,1,159,141,134,2,177
580 DATA 253,201,32,240,7,32,
   210,255,200,76,136,193,
   160,0,173,2,159,141,134
590 DATA 2,185,180,193,201,0,
   240,10,32,210,255,200,76,
   157,193,32,210,255,169
600 DATA 255,141,10,159,96,
   32,73,83,32,78,79,84,32,
   73,78,32,77,89,32,68,73,67
610 DATA 84,73,79,78,65,82,
   89,0
620 REM
630 FOR I=49152 TO 49612
640 READ X: POKE I,X:NEXT
650 REM***************
660 REM* OBJECTS M/C *
670 REM***************
680 DATA 76,6,195,76,112,195,
   32,166,195,165,20,141,182,
   195,169,255,141,183,195
690 DATA 160,0,140,177,195,
   140,178,195,172,178,195,
   185,0,196,205,182,195,208
700 DATA 62,169,0,133,251,
   169,134,133,252,173,178,
   195,141,177,195,173,177,
   195
710 DATA 240,21,24,165,251,
   105,16,133,251,165,252,
   105,0,133,252,206,177,195,
   173
720 DATA 177,195,208,235,160,
   0,177,251,32,210,255,200,
   192,16,144,246,169,13,32
730 DATA 210,255,169,0,141,
   183,195,238,178,195,173,
   178,195,205,184,195,208,
   172
740 DATA 96,32,166,195,164,
   20,136,140,177,195,32,166,
   195,165,20,141,180,195,32
750 DATA 166,195,165,20,141,
   181,195,172,177,195,185,0,
   196,205,180,195,240,6,169
760 DATA 255,141,183,195,96,
   173,181,195,153,0,196,169,
   0,141,183,195,96,32,253
770 DATA 174,32,138,173,32,
   247,183,96,0,0,0,0,0,0,0,
   0,255
780 FOR I=49920 TO 50104
790 READ X: POKE I,X: NEXT
```

PROGRAM: LISTING 1

```
10 PRINT CHR$(147)
20 TA(1)=38656: TL(1)=40716: ML(1)=256: REM VERB TABLE
30 TA(2)=39680: TL(2)=40717: ML(2)=256: REM NOUN TABLE
40 TA(3)=38400: TL(3)=40718: ML(3)=64:  REM LINK TABLE
50 VN=40707:NN=40708:PN=40709
60 :
70 :
80 DE=8
90 POKE 53280,11:POKE 53281,12:POKE 646,0:PRINT CHR$(147)
100 POKE 40705,0:POKE 40706,1
110 X=6:Y=5:GOSUB 930
   :PRINT"ADVENTURE INTERPRETOR EDITOR"
120 X=6:Y=7:GOSUB 930
   :PRINT"1. ADD A WORD TO DICTIONARY"
130 X=6:Y=8:GOSUB 930
   :PRINT"2. CHANGE A WORD"
140 X=6:Y=9:GOSUB 930
   :PRINT"3. LIST DICTIONARY"
150 X=6:Y=10:GOSUB 930
   :PRINT"4. TEST INTERPRETOR"
160 X=6:Y=11:GOSUB 930
   :PRINT"5. SAVE/LOAD DATA"
170 X=6:Y=12:GOSUB 930
   :PRINT"6. ERASE TABLES"
180 GET I$:IF I$<"1"OR I$>"6"THEN 180
190 ON VAL(I$)GOTO 380,310,200,470,600,560
200 FL=1:  GOSUB 760
210 IF PEEK(TL(N))=0 THEN PRINT"[CLEAR]NO WORDS IN TABLE":GOSUB 900
   :PRINT"[CLEAR]":GOTO 110
220 WN=1:PRINT CHR$(147)
230 PRINT"WORD #"WN"[SPC2]";
240 FOR I=1 TO 4
250 PRINT CHR$(PEEK(TA(N)+I-1+(WN-1)*4));:NEXT:PRINT
260 WN=WN+1:IF WN<>20 THEN 290
270 GOSUB 900
280 PRINT CHR$(147):GOTO 230
290 IF WN<=PEEK(TL(N))THEN 230
300 GOSUB 900:PRINT CHR$(147)
   :GOTO 110
310 GOSUB 760
320 INPUT"[DOWN3]INPUT WORD";WO$
330 IF LEN(WO$)>4 THEN WO$=LEFT$(WO$,4):GOTO 350
340 IF LEN(WO$)<4 THEN WO$=WO$+CHR$(32):GOTO 340
350 FOR I=1 TO 4
360 POKE(TA(N)+I-1+(WN-1)*4),ASC(MID$(WO$,I,1)):NEXT
370 PRINT CHR$(147):GOTO 110
380 FL=1:GOSUB 760
390 WN=PEEK(TL(N))+1
   :IF WN<ML(N)THEN 400
395 PRINT"NO ROOM IN TABLE"
   :FOR D=1 TO 3000:NEXT
   :GOTO 460
400 INPUT"[DOWN3]INPUT WORD";WO$
410 IF LEN(WO$)>4 THEN WO$=LEFT$(WO$,4):GOTO 430
420 IF LEN(WO$)<4 THEN WO$=WO$+CHR$(32):GOTO 420
430 FOR I=1 TO 4
440 POKE(TA(N)+I-1+(WN-1)*4),ASC(MID$(WO$,I,1)):NEXT
450 POKE TL(N),PEEK(TL(N))+1
460 PRINT CHR$(147):GOTO 110
470 PRINT CHR$(147)
   :SYS 12*4096,0,22
480 PRINT"[HOME,BLACK]VERB NUMBER"PEEK(40711)
490 PRINT"NOUN NUMBER"PEEK(40712)
500 PRINT"LINK WORD NUMBER"PEEK(40713)
510 PRINT"[RVSON,DOWN,RIGHT,SPC7]PRESS A KEY TO CONTINUE[SPC8]"
520 PRINT"[RVSON,DOWN,RIGHT,SPC10]PRESS * TO EXIT[SPC13]"
530 GET I$:IF I$=""THEN 530
540 IF I$="*"THEN PRINT CHR$(147):GOTO 110
550 GOTO 470
560 PRINT CHR$(147)"CLEARING TABLES"
570 FOR I=40716 TO 40718
   :POKE I,0:NEXT
580 FOR I=38400 TO 40703
   :POKE I,32:NEXT
590 PRINT CHR$(147):GOTO 110
600 PRINT CHR$(147);
   :INPUT"SAVE OR LOAD (S/L)";I$
610 IF I$="S"THEN 640
620 IF I$="L"THEN 680
630 GOTO 600
640 INPUT"[DOWN2]FILE NAME";FI$
650 PRINT"[DOWN2]SAVING...."
660 SYS 50688 FI$,DE,2,38400,40959
670 PRINT CHR$(147):GOTO 110
680 INPUT"[DOWN2]FILE NAME";FI$
690 PRINT"[DOWN2]LOADING..."
700 SYS 679,FI$,DE,38400
710 PRINT CHR$(147):GOTO 110
720 PRINT CHR$(147)"CURRENT DEVICE IS"DE
730 INPUT NEW DEVICE";DE
740 PRINT CHR$(147):GOTO 110
750 END
760 PRINT CHR$(147)
   :INPUT"WHICH TABLE(V/N/L)";I$
770 IF I$="V"THEN N=1
   :GOTO 810
780 IF I$="N"THEN N=2
   :GOTO 810
790 IF I$="L"THEN N=3
   :GOTO 810
800 GOTO 760
810 IF FL=1 THEN FL=0:RETURN
820 INPUT"[DOWN2]
   WORD NUMBER";WN
825 IF WN>ML(N)THEN 820
830 IF WN>PEEK(TL(N))OR WN=0 THEN 820
840 PRINT"[DOWN2]WORD NO"WN"IS ";:
850 FOR I=1 TO 4
860 PRINT CHR$(PEEK(TA(N)+I-1+(WN-1)*4));:NEXT:PRINT
870 INPUT"[DOWN2]
   OK TO PROCEED";I$
880 IF I$<>"Y"THEN 760
890 RETURN
900 PRINT"[RVSON,DOWN,RIGHT,SPC7]PRESS A KEY TO CONTINUE[SPC8]"
910 GET I$:IF I$=""THEN 910
920 RETURN
930 POKE 781,Y:POKE 782,X
   :POKE 783,0:SYS 65520
   :RETURN
940 REM************************
950 REM* INTERPRETOR EDITOR *
960 REM************************
```

performs a similar function on text stored behind the Kernal ROM (the upper text area).

The start addresses of the messages are kept in two tables. The function of the editor in Listing 2 allows you to create the text and sets up the tables accordingly.

In order to allow you to store messages of any length, up to a maximum of 255 characters, the editor does not allow you to edit text that has been entered. I therefore strongly recommend that you write down your text before creating the text data base. And enter it with care!

Again, menus are used to aid editing. The editor acts mainly on the lower text area, if you wish to create a database in the upper text area, commands are provided which convert a lower area file to an upper area file. Again, you may save and load text but in this case two files are saved: The text file and the table file

The table file has the same name as the text file but is suffixed by .T. For example:
Textfile name — WOMBAT
Tablefile name — WOMBAT.T

Obviously the files are loaded to different addresses. If you use the loader provided, the start addresses are:
Low area — text address = 40960, table address = 51968.
High area — text address = 57344, table address = 52480.

You can include colour changes or control codes into text by pressing the corresponding CTRL or CBM key combinations when entering text. Before creation of new text files, don't forget to use the erase option.

Finally, what do we do with objects? In any adventure you need to know where objects are kept so you can take, drop or look at them. Two sets of data are saved by the editor in Listing 3.

First there is a table of object names. Each can be up to 16 characters long. A second table keeps a record of the location of the objects (this table starts at 50176).

The machine code lists the items held at a specific location and has the syntax:

SYS 49920,LO

where LO is the location concerned. Each item is

printed on a new line so you must allow for this in your screen format. This option can equally be used for inventory or look commands.

To perform Inventory, you then use:

10 PRINT "YOU'RE CARRYING:"
20 SYS 49920,255

I have assumed that location 255 refers to possessed objects. To perform Look, use:

10 PRINT "YOU CAN SEE:"
20 SYS 49920,LO

Here, LO is the location number.

To check whether an object is available for taking, dropping, examining etc, simply PEEK the relevant entry for the object in the position table.

As with the text editor, the object data base is saved as two files: the object table and the position table. As before, the position table has the same name, albeit suffixed by .T.

The Save and Load routines given earlier may well be of value in your own programs. The Save transfers the block of memory from SA to FA to device DE and has the syntax:

SYS 50688 Filename,DE,2,SA,FA

The Load routine is extemely handy. You will know that if you use LOAD with a secondary address of one (to force a relocated load) that the program reruns. The Load allows you to load a block of data to any specified address SA and does not try to rerun your program. The syntax is:

SYS 679,File name,DE,SA

Study the example program which shows the use of the three sets of routines.

The routine assumes the following:
1. The verbs Take, Look, Inventory and Drop occupy the first four positions in the verb table i.e. Take = 1, Look = 2 etc.
2. There is an object e.g. a sword, in the noun table.
3. The object specified in 2 is in location 1.
4. The location descriptions start at message 0 in the lower text area.
5. All possessed items are in location 255.



PROGRAM: LISTING 2

```
10 POKE 53280,11:POKE 53281,
   12:POKE 646,0
20 FOR I=0 TO 79: BL$=BL$+CH
   R$(32):NEXT
30 POKE 650,128
40 DE=8
50 REM
60 REM MAIN MENU
70 REM
80 PRINT CHR$(147): X=14: Y=8
   : GOSUB 1410:PRINT"MAIN
   MENU": Y=10: X=10
90 GOSUB 1410:PRINT"1. LOWER
   TEXT AREA"
100 Y=11:GOSUB 1410
   :PRINT"2. CONVERT FOR UPP
   ER AREA"
110 Y=12:GOSUB 1410
   :PRINT"3. SAVE/LOAD DATA"
120 Y=13:GOSUB 1410
   :PRINT"4. DEVICE"
130 Y=14:GOSUB 1410
   :PRINT"5. LOAD & CHECK
   IN UPPER AREA"
140 GET I$:IF I$<"1"OR I$>"5
   "THEN 140
150 ON VAL(I$) GOTO 190,670,
   750,1090,1150
160 REM
170 REM TEXT AREA MENU
180 REM
190 PRINT CHR$(147): X=14:Y=8
   :GOSUB 1410:PRINT"LOWER
   TEXT AREA"
200 X=15:Y=10:GOSUB 1410
   :PRINT"1.VIEW TEXT"
210 X=15:Y=11:GOSUB 1410
   :PRINT"2.ENTER TEXT"
220 X=15:Y=12:GOSUB 1410
   :PRINT"3.ERASE TABLES"
230 X=15:Y=13:GOSUB 1410
   :PRINT"4.MAIN MENU"
240 GET I$:IF I$<"0"OR I$>"4
   "THEN 240
250 ON VAL(I$) GOTO 260,410,
   580,80
260 PRINT CHR$(147)
270 REM
280 REM VIEW TEXT
290 REM
300 MN=0
310 IF PEEK(52224+MN)=0 THEN
   190
320 PRINT"[RED]MESSAGE #
   [BLACK]";MN
330 PRINT CHR$(158)
   :SYS 51456,MN:PRINT
340 PRINT"------------------
   ----------------------
   [BLACK]"
350 GET I$:IF I$=""THEN 350
360 MN=MN+1:GOTO 310
370 GOTO 190
380 REM
390 REM ENTER TEXT
400 REM
410 PRINT CHR$(147):MN=0
420 IF PEEK(52224+MN)=0 THEN
   440
430 MN=MN+1:GOTO 420
440 IF MN=0 THEN SA=40960
   :FA=SA:GOTO 485
450 SA=PEEK(52224+MN-1)*256+
   PEEK(51968+MN-1)
460 FA=SA
470 SYS 50944,FA:IF PEEK(100
   0)=0 THEN 485
480 FA=FA+1:GOTO 470
485 FM=49151-FA:PRINT"[HOME]
   FREE MEMORY="FM" BYTES"
490 M$="MESSAGE #"+STR$(MN)
   :GOSUB 1290: IF SA=40960
   AND MN=0 THEN 510
500 SA=FA+1:IF FA>49152 THEN
   190
510 POKE 52224+MN,SA/256
520 POKE 51968+MN,
   SA-INT(SA/256)*256
525 IF FM<LEN(ME$)THEN PRINT
   "NO ROOM FOR MESSAGE"
   :FOR D=1 TO 3000:NEXT
   :GOTO 190
530 FOR I=1 TO LEN(ME$)
540 POKE SA-1+I,ASC(MID$(ME$,
   I,1)):NEXT:POKE SA+I,0
   :GOTO 190
550 REM
560 REM CLEAR LOWER AREA
570 REM
580 PRINT CHR$(147)"CLEARING
   TEXT TABLES"
590 FOR MN=0 TO 254
600 POKE 51968+MN,0
   :POKE 52224+MN,0:NEXT
610 PRINT CHR$(147)"CLEARING
   TEXT AREA"
620 FOR I= 40960 TO 49151
   : POKE I,0:NEXT
630 GOTO 190
640 REM
650 REM CONVERT ADDRESS TABLE
660 REM
670 I=0:PRINT CHR$(147)"CONV
   ERTING ADDRESS TABLE"
680 Z=PEEK(52224+I)
   :IF Z=0 THEN 710
690 POKE 52224+I,Z+64
700 I=I+1:IF I<256 THEN 680
710 GOTO 190
720 REM
730 REM SAVE/LOAD
740 REM
750 PRINT CHR$(147): X=14
```

```
    : Y=8: GOSUB 1410
    :PRINT"SAVE/LOAD": Y=10
    : X=13
760 GOSUB 1410:PRINT"1. SAVE
    DATA"
770 Y=11:GOSUB 1410
    :PRINT"2. LOAD DATA"
780 GET I$:IF I$<"0"OR I$>"2
    "THEN 780
790 ON VAL(I$) GOTO 830,950
800 REM
810 REM SAVE DATA
820 REM
830 PRINT CHR$(147): X=14
    : Y=8: GOSUB 1410
    :PRINT"SAVE": Y=10: X=10
840 REM SAVE TEXT AREA
850 PRINT CHR$(147)
    :INPUT "FILE NAME FOR TEX
    T AREA";FI$
860 PRINT"[DOWN]SAVING TEXT"
870 SYS 50688 FI$,DE,2,40960,
    49151
880 FI$=FI$+".T"
890 PRINT"SAVING ADDRESS TAB
    LES"
900 SYS 50688 FI$,DE,2,51968,
    52479
910 GOTO 190
920 REM
930 REM LOAD
940 REM
950 PRINT CHR$(147):
960 REM
970 REM LOAD TEXT AREA
980 REM
990 PRINT CHR$(147)"LOAD TEX
    T AREA"
1000 INPUT "[DOWN]FILE NAME";
     FI$
1010 PRINT"[DOWN]
     LOADING TEXT"
1020 SYS 679,FI$,DE,40960
1030 FI$=FI$+".T"
1040 PRINT"LOADING ADDRESS
     TABLES"
1050 SYS 679,FI$,DE,51968
     :GOTO 190
1060 REM
1070 REM DEVICE
1080 REM
1090 PRINT CHR$(147)"CURRENT
     STOREAGE DEVICE IS"DE
1100 INPUT"[DOWN]DEVICE";DE
1110 GOTO 80
1120 REM
1130 REM CHECK UPPER AREA
1140 REM
1150 PRINT CHR$(147)
     :INPUT"FILE NAME";FI$
1160 PRINT"[DOWN]
     LOADING TEXT TO UPPER ARE
     A":SYS 679,FI$,DE,57344
1170 FI$=FI$+".T"
     :PRINT"[DOWN]LOADING ADDR
     ESS TABLES":SYS 679,FI$,
     DE,52480
1180 MN=0:PRINT CHR$(147)"TE
     XT IN UPPER AREA"
1190 IF PEEK(52736+MN)=0 THE
     N 190
1200 PRINT"[RED]MESSAGE #
     [WHITE]";MN
1210 PRINT CHR$(158)
     :SYS 51459,MN:PRINT
1220 PRINT"-----------------
     ----------------------
     [BLACK]"
1230 GET I$:IF I$=""THEN 1230
1240 MN=MN+1:GOTO 1190
1250 GOTO 80
1260 REM
1270 REM INPUT A STRING
1280 REM
1290 ME$="":PRINT M$
1300 GET I$:IF I$=""THEN 1300
1310 IF I$=CHR$(13)THEN 1370
1320 IF LEN(ME$)=254 AND I$<
     >CHR$(20)THEN 1300
1330 IF I$=CHR$(19)OR I$=CHR
     $(147)OR I$=CHR$(148)THEN
     1300
1340 IF I$=CHR$(20)THEN ME$=
     LEFT$(ME$,LEN(ME$)-1)
     :GOTO 1360
1350 ME$=ME$+I$
1360 PRINT CHR$(147)"FREE
     MEMORY="FM-LEN(ME$)" BYT
     ES"
1365 PRINT M$:PRINT ME$
     :GOTO 1300
1370 RETURN
1380 REM
1390 REM SET CURSOR TO X,Y
1400 REM
1410 POKE 781,Y: POKE 782,X
     : POKE 783,0: SYS 65520
     : RETURN
1420 REM
1430 REM ***************
1440 REM * TEXT EDITOR *
1450 REM ***************
```



The important features of the example are:

Line 10 – protects the data bases.

Lines 20-46 – Load the data bases.

Line 50 – Sets up the colours and the location number (LO).

Line 55 – Tells you where you are i.e. performs LOOK.

Line 60 – Requests a command

Line 70 – Checks for an unrecognised command and clears the command area of the screen prior to requesting a new command.

Line 80 – Extracts the key words. Note that the noun number must be decremented to be compatible with the object routine. (Nouns are numbered from 1 to 255 and objects from 0 to 254)

Line 90 – Performs verb

Note how the Take and Drop commands simply change the object position table. Location 50163 is an error flag for the object routine. If it contains 255, then it means that nothing was found (see lines 170 and 210).

I hope this example will show how simple these routines are to use and how compact routines become.

Whilst I've tried to ensure complete compatibility between the three editors, Murphy's Law will guarantee that I will have missed something somewhere. To ensure insanity-free work, I remembered the following precautions.

1. Before starting work with an editor and after using another editor:
Save your latest database
Reset the machine with SYS 64738
Load the machine code
2. Regularly save your data base.
3. Work out what the database will contain before starting work.

If you have any queries, study the editors, you should be able to sort them out. If you have any real problems, you can reach me via Your Commodore.

PROGRAM: LISTING 3

```
10 PRINT CHR$(147):DE=8
   :GOSUB 330
20 POKE 53280,12:POKE 53281,15
   :PRINT"[BLACK]"
30 PRINT CHR$(147):Y=4:X=10
   :GOSUB 150:PRINT"OBJECT
   EDITOR"
40 Y=6:X=10:GOSUB 150
   :PRINT"1. ENTER OBJECT"
```

```
50 Y=7:X=10:GOSUB 150:PRINT"2. TEST TABLES"
60 Y=8:X=10:GOSUB 150:PRINT"3. CLEAR TABLES"
70 Y=9:X=10:GOSUB 150:PRINT"4. PRINT TABLES"
80 Y=10:X=10:GOSUB 150:PRINT"5. SAVE TABLES"
90 Y=11:X=10:GOSUB 150:PRINT"6. LOAD TABLES"
100 Y=12:X=10:GOSUB 150:PRINT"7. CHANGE DEVICE"
110 Y=13:X=10:GOSUB 150:PRINT"8. CHANGE LOCATION"
120 GET I$:IF I$<"1"OR I$>"8" THEN 120
130 ON VAL(I$) GOSUB 160,250,330,380,500,560,620,630
140 GOTO 20
150 POKE 781,Y:POKE 782,X:POKE 783,0:SYS 65520:RETURN
160 PRINT CHR$(147):OB=0
165 IF PEEK(50176+OB)<>0 AND OB<255 THEN OB=OB+1:GOTO 165
166 PRINT"NEXT AVAILABLE ENTRY ="OB
170 INPUT "WORD (16 CHARS MAX)";WO$
180 IF LEN(WO$)<16 THEN WO$=WO$+" ":GOTO 180
190 WA=34304+OB*16-1
200 FOR I=1 TO 16: POKE WA+I,ASC(MID$(WO$,I,1)):NEXT
210 PRINT"[DOWN]PLACED IN TABLE"
220 PRINT"[DOWN]LOCATION OF "WO$" ";:INPUT LO
230 POKE 50176+OB,LO
240 RETURN
250 PRINT CHR$(147):INPUT "LOCATION";LO
260 PRINT"[DOWN]AT LOCATION"LO" I CAN SEE"
270 SYS 49920,LO
280 IF PEEK(50103)=255 THEN PRINT"[DOWN]NOTHING"
290 Y=15:X=0:GOSUB 150:PRINT"[SPC2,RVSON,SPC9]PRESS * TO EXIT[SPC11]"
300 GET I$:IF I$=""THEN 290
310 IF I$<>"*"THEN 250
320 PRINT CHR$(147);:RETURN
330 PRINT CHR$(147)"CLEARING TABLES...."
340 FOR I=0 TO 255: POKE 50176+I,0:NEXT
350 PRINT"[DOWN]CLEARING TEXT"
360 FOR I=34304 TO 38399:POKE I,0:NEXT
370 RETURN
380 PRINT CHR$(147):WN=0
390 IF PEEK(50176+WN)=0 THEN 470
400 WA=34304+WN*16-1:PRINT"OBJECT"WN"...";
410 FOR I=1 TO 16:PRINT CHR$(PEEK(WA+I));:NEXT:PRINT" AT LOC"PEEK(50176+WN)
420 WN=WN+1:IF WN=255 THEN 390
430 IF INT(WN/20)<>WN/20 THEN 390
440 Y=22:X=0:GOSUB 150:PRINT"[SPC2,RVSON,SPC9]PRESS * FOR MORE[SPC10]"
450 GET I$:IF I$<>"*"THEN 450
460 PRINT CHR$(147):GOTO 390
470 Y=22:X=0:GOSUB 150:PRINT"[SPC2,RVSON,SPC9]PRESS * TO EXIT[SPC10]"
480 GET I$:IF I$<>"*"THEN 480
490 RETURN
500 PRINT CHR$(147):INPUT"FILE NAME";FI$
510 PRINT"[DOWN]SAVING TEXT...."
520 SYS 50688 FI$,DE,2,34304,38399
530 PRINT"[DOWN]SAVING TABLE....":FI$=FI$+".T"
540 SYS 50688 FI$,DE,2,50176,50431
550 RETURN
560 PRINT CHR$(147):INPUT"FILE NAME";FI$
570 PRINT"LOADING TEXT...."
580 SYS 679,FI$,DE,34304
590 PRINT"LOADING TABLE....":FI$=FI$+".T"
600 SYS 679,FI$,DE,50176
610 RETURN
620 PRINT CHR$(147):INPUT"DEVICE";DE:RETURN
630 PRINT CHR$(147):INPUT"WORD NUMBER";WN
640 PRINT"[DOWN]"
650 WA=34304+WN*16-1:PRINT"OBJECT"WN"...";
660 FOR I=1 TO 16:PRINT CHR$(PEEK(WA+I));:NEXT:PRINT" AT LOC"PEEK(50176+WN)
670 INPUT"[DOWN2]NEW LOCATION";LO
680 POKE 50176+WN,LO:RETURN
690 REM****************
700 REM OBJECT EDITOR *
710 REM****************
```

Joe Nicholson continues his series with a Sound Synthesiser for the C-16 and Plus/4.

Programming The C-16

SOME TIME AGO, IN MY ARTicle on sound, I promised to explain how to simulate the attack, decay, sustain and release functions of a sound synthesiser. At last, tweeked and tuned up to perfection, I proudly present The Sound Synthesiser which incorporates not only these functions, but also a host of other facilities including a second channel, rests, hand claps, a sound compiler and a waveform editor.

I shall start by explaining the similarities to the PLAY command presented in the article on sound (December 1985). Like the PLAY command it is interrupt driven, meaning that the tune can be playing while the computer is engaged in some other task, playing a game or editing a waveform for instance. It plays the tune by reading along a list of numbers held in memory which contain the pitch and duration of each note, in the sequence that the notes will follow. Commands such as volume, go to chorus, return and turn tune off can also be included in the list. Pitch values for a range of musical notes are given in Appendix D of the C-16 User Manual on page 173.

Now for the differences. The main feature is WAVEFORM SOUND. It works by continuously altering the volume of the note once every 1/50th of a second from a list stored in memory. When each new note is played, the synthesiser starts at the beginning of the table setting the volume to the first number. A 1/50th of a second later the synthesiser reads the next byte along the list and adjusts the volume to that number. The process continues for the duration of the note until a new note is played, changing the volume of the note from the very beginning all the way through until it dies away; when the process repeats itself. The list can be stored anywhere in memory, although the table must begin at an address which is a multiple of 256 and must be 256 bytes long.

As the volume is in the range zero to eight, only nine different volume settings are allowed. It is still possible, however, to make a very convincing envelope with attack, decay sustain and release as shown in the diagram below. The attack part of the waveform covers the rise in volume from zero to peak value. The fall in volume after the peak is called the decay. The midrange volume is called the sustain level and the final fall in volume from sustain to zero is called the release.

The parameters attack, decay, sustain and release can be applied to any sound. Consider the sound of a piano for instance. When the string is first struck by the hammer, the volume of the note quickly rises to peak level, therefore its attack rate is quite high. The volume then quickly falls to a lower value signifying a high decay rate and then sustains at this level for a while before dying away fairly slowly, which means it has a low release rate. The sound of a clarinet or other woodwind instrument is very different however. In this case the volume of the note rises slowly to peak value meaning it has a low attack rate. The volume then sustains for the remainder of the note and is followed by a rapid release.

The Sound Synthesiser allows more than one waveform to be in memory at the same time and also has the facility to switch from one waveform to another while the tune is being played thus simulating different instruments. Memory has been set aside for two waveforms, although more can be accommodated by raising the start of the Basic area or lowering the top of this area to create extra space for waveform sound (as explained in the September 1985 issue of Your Commodore). Lowering the top of Basic by 1K would reserve enough space for four more waveforms. A waveform editor program and a demonstration waveform have also been included.

The other main difference between this program and the PLAY command is the facility to play tunes using both channels. This enables harmonies and backings to be put into the

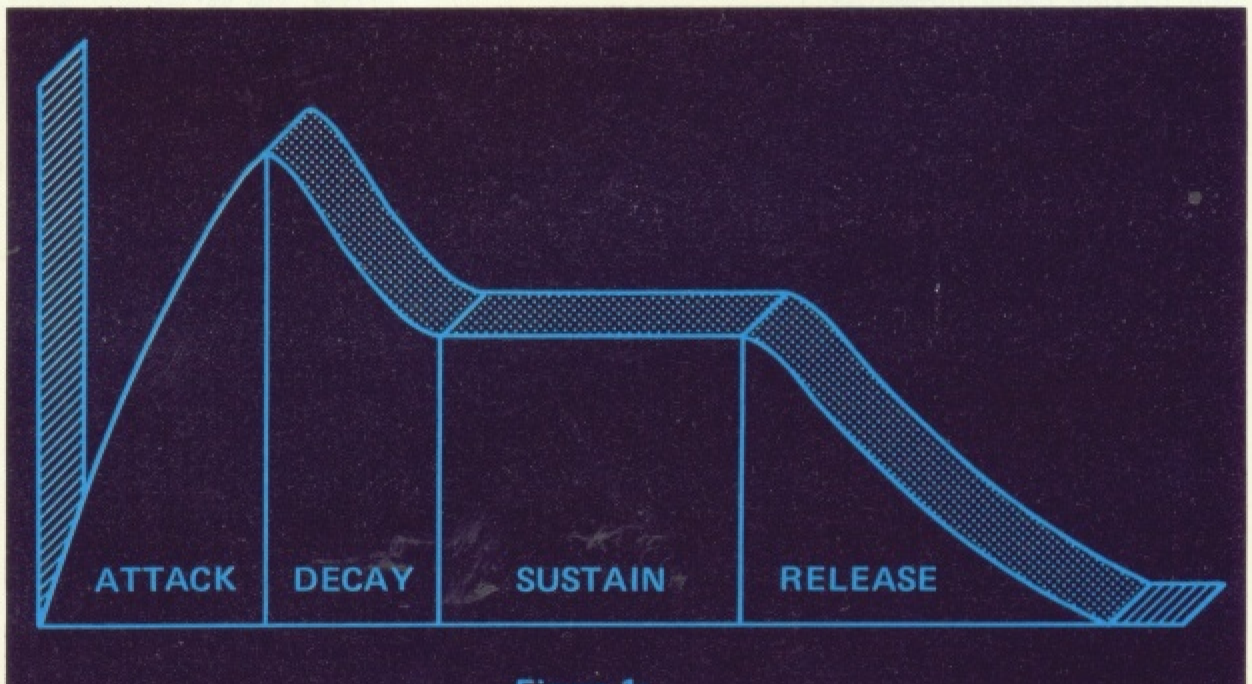


Figure 1:

tune, along with such sounds as hand claps and steam trains if channel two is set to noise! Channel one still sets the pace of the tune, with the backing note in channel two being changed at various points along the tune. This will be demonstrated in a tune called Joe's theme (!) later on.

As well as playing backing notes channel two can add a chorus effect to the sound. This is done by taking the pitch of the note in channel one and playing exactly the same pitch in channel two but with a small constant value added to the pitch. This has the effect of two notes in 'harmony' by using an effect known as beating. This effect was used to play God Save the Queen in demo one of my article on graphics modes published in the March 1986 issue. A command to create this effect is provided in the synthesiser. Channel two also has the facility for turning itself off automatically a preset time after it is turned on instead of carrying on indefinitely – useful for hand claps, etc.

The other addition to the PLAY command is the facility for rests and pauses. In the PLAY command all notes tended to merge together and there was no facility for pausing the tune for rests etc. The Synthesiser allows the tune to pause for 1/50th second right up to 20 minutes. It also allows the second (backing) channel to either continue while the first channel pauses or for both channels to be turned off for the duration of the pause with the backing being turned on again after the pause.

The Synthesiser

The new assembly language is shown in Figure 2. If you wish to type it straight in use my 'C-16 Assembler' published in the June 1985 issue of Your Commodore. To date this is the only text assembler available for the C-16. If you don't have the assembler, the machine code is shown in DATA statements in Figure 3 complete with a suitable loader. The synthesiser code starts at address 4096 ($1000 hex) and occupies 512 bytes. The start of Basic should therefore be moved up before loading the assembler or the machine code. If the start of Basic is

Figure 2

PROGRAM: SYNTHTEXT

```
10000 ;THE SOUND SYNTHESISER
10010 ;(C)1986 JOE NICHOLSON
10020 ;
10050 ORG $1000
10100 ;TURN ON
10110 :ON SEI
10120 LDA #$42
10130 STA $314
10140 LDA #$10
10150 STA $315
10160 LDA #$20
10170 STA $D7
10180 LDA #$00
10190 STA $DA
10200 STA $E0
10210 STA $E1
10220 STA $DC
10230 STA $DD
10240 LDA $FF11
10250 AND #$7F
10260 STA $FF11
10270 LDA #$FE
10280 STA $04FC
10290 STA $04FE
10300 CLI
10310 RTS
10390 ;
10400 ;TURN OFF
10410 :OF SEI
10420 LDA $FF11
10430 AND #$8F
10440 STA $FF11
10450 LDA #$0E
10460 STA $0314
10470 LDA #$CE
10480 STA $0315
10490 CLI
10500 RTS
10590 ;
10600 ;PLAY CONTROL
10610 ORG $1042
10700 :PL LDA $04FC
10710 CMP #$FF
10720 BEQ R:P2
10730 :P5 LDA $E0
10740 BEQ R:EX
10750 LDY #0
10760 LDA $FF11
10770 AND #$F0
10780 ORA ($DE),Y
10790 STA $FF11
10800 INC $DE
10810 :EX JMP $CE0E
10890 ;
10900 ;READ NEXT THREE BYTES
10910 :P2 LDA $E1
10920 BEQ R:PK
10930 LDA $FF11
10940 ORA $E1
10950 STA $FF11
10960 LDA #$00
10970 STA $E1
10980 :PK LDY #$00
10990 LDX #$00
11000 :P3 LDA ($D0),Y
11010 STA $D2,X
11020 INY
11030 INX
11040 TXA
11050 CMP #3
11060 BNE R:P3
11070 LDA $D0
11080 ADC #2
11090 STA $D0
11100 BCC R:P4
11110 INC $D1
11190 ;
11200 ;OFF
11210 :P4 LDA $D2
11220 CMP #$FF
11230 BNE R:P6
11240 JSR :OF
11250 :PX CLC
11260 BCC R:EX
11264 ;
11265 ;GOSUB
11270 :P6 CMP #$FE
11280 BNE R:P7
11290 LDA $D0
11300 STA $D5
11310 LDA $D3
11320 STA $D0
11330 LDA $D1
11340 STA $D6
11350 LDA $D4
11360 STA $D1
11370 CLC
11380 BCC R:P2
11390 ;
11395 ;RETURN
11400 :P7 CMP #$FD
11410 BNE R:P8
11420 LDA $D5
11430 STA $D0
11440 LDA $D6
11450 STA $D1
11460 CLC
11470 BCC R:P2
11475 ;
11480 ;VOLUME
11490 :P8 CMP #$FC
11500 BNE R:P9
11510 LDA $FF11
11520 AND #240
11525 ORA $D3
11530 STA $FF11
11540 :PM CLC
11550 BCC R:P2
11590 ;
11600 ;NOISE/MUSIC 2ND CHANNEL
11610 :P9 CMP #$FB
11620 BNE R:PA
11630 LDA $D3
11640 CMP #2
11650 BEQ R:N1
11660 LDA #$40
11670 BNE R:N0
11680 :N1 LDA #$20
11690 :N0 STA $D7
11700 CLC
11710 BCC R:PM
11790 ;
11800 ;SET 2ND CHANNEL DEVIATION
11810 :PA CMP #$FA
11820 BNE R:PB
11830 LDA $D3
11840 STA $D8
11850 LDA $D4
11860 STA $D9
11870 ORA $D3
11880 STA $DA
11890 BNE R:PM
11900 BEQ R:PR
11990 ;
12000 ;OFF CHANNEL 2
12010 :PB CMP #$F9
12020 BNE R:PC
12030 :PR LDA $FF11
12040 AND #$9F
12050 STA $FF11
12060 CLC
12070 :PO BCC R:PM
12090 ;
12100 ;SECOND CHANNEL
12110 :PC CMP #$F8
12120 BNE R:PD
12130 LDA $D3
12140 STA $FF0F
12150 LDA $D4
12160 STA $FF10
12170 LDA $DC
12180 STA $04FD
12190 LDA $DD
12200 STA $04FF
12210 LDA $FF11
12220 AND #$9F
12230 ORA $D7
```

```
12240 STA $FF11
12250 BNE R:PM
12290 ;
12300 ;SET INTERVAL FOR
12310 ;SECOND CHANNEL
12320 :PD CMP #$F7
12330 BNE R:PE
12340 LDA $D3
12350 ORA $D4
12360 BNE R:N2
12370 STA $DC
12380 STA $DD
12390 BEQ R:PO
12400 :N2 LDA $D3
12410 EOR #$FF
12420 STA $DC
12430 LDA $D4
12440 EOR #$FF
12450 STA $DD
12460 CLC
12470 BCC R:PO
12490 ;
12500 ;ON/OFF WAVEFORM SOUND
12510 :PE CMP #$F6
12520 BNE R:PF
12530 LDA $D3
12540 STA $E0
12550 BNE R:N3
12560 LDA $FF11
12570 AND #$F0
12580 ORA $DB
12590 STA $FF11
12600 CLC
12610 BCC R:PO
12620 :N3 LDA $FF11
12630 AND #$0F
12640 STA $DB
12650 CLC
12660 BCC R:PO
12690 ;
12700 ;SET WAVE NUMBER
12710 :PF CMP #$F5
12720 BNE R:PG
12730 LDA $D3
12740 STA $DF
12750 CLC
12760 BCC R:PO
12790 ;
12800 ;JUMP TO USER ROUTINE
12810 :PG CMP #$F4
12820 BNE R:PH
12830 JSR :N4
12840 CLC
12850 BCC R:PO
12860 :N4 JMP ($D3)
12890 ;
12900 ;PAUSE ALL
12910 :PH CMP #$F3
12920 BNE R:PJ
12930 LDA $FF11
12940 TAX
12950 AND #$60
12960 STA $E1
12970 TXA
12980 AND #$8F
12990 STA $FF11
13000 LDA $D3
13010 EOR #$FF
13020 STA $04FC
13030 LDA $D4
13040 EOR #$FF
13050 STA $04FE
13060 JMP $CE0E
13090 ;
13100 ;MAIN ROUTINE
13110 :PJ EOR #$FF
13120 STA $04FC
13130 LDA #$FF
13140 STA $04FE
13150 LDA #0
13160 STA $DE
13170 LDA $D3
13180 ORA $D4
13190 BNE R:PP
13200 LDA $FF11
13210 AND #$EF
13220 STA $FF11
13230 :PQ JMP $CE0E
13250 :PP LDA $FF12
13260 AND #252
13270 ORA $D4
13280 STA $FF12
13290 STA $D3
13300 STA $FF0E
13310 LDA $FF11
13320 ORA #$10
13330 STA $FF11
13340 LDA $DA
13350 BEQ R:PQ
13360 CLC
13370 LDA $D3
13380 ADC $D8
13390 STA $FF0F
13400 LDA $D4
13410 ADC $D9
13420 STA $FF10
13430 LDA $FF11
13440 ORA $D7
13450 STA $FF11
13460 LDA $DC
13470 STA $04FD
13480 LDA $DD
13490 STA $04FF
13500 JMP $CE0E
```

moved up by 2K, space for two waveforms and 1K of tune is also set up – see Figure 4. 1K is usually enough for a tune of reasonable length as only three bytes are used per note or command. If more space is required for the tune then the start of Basic should be moved up accordingly.

To move the start of Basic up by 2K enter the following:

POKE 6144,0:POKE 44,24:NEW

To move start of Basic up by X Kbytes enter:

POKE 4096+X*1024,0:POKE 44,16+X*4:NEW

The tune does not have to start at address 5120, in fact the tune can start anywhere and any number of different tunes can be stored anywhere in memory to the limit of the space available.

When the Synthesiser assembly text or DATA statements have been typed in, SAVE it before going any further as you may have made a mistake. Run the assembler/loader and correct any errors. Then SAVE the machine code by entering the monitor, i.e. MONITOR + return. Then type in: S"name",01,1000,1200 to save the Synthesiser; S"name",01,1200,1400 to save the waveforms, where S signifies SAVE,01 signifies tape and $1000 and $1200 are the start address and the (end address+1).

The Program in Detail

Lines 10100-10310 turn the synthesiser on. This redirects the keyboard interrupt, which is called 50 times/sec, to enter the Synthesiser at line 10700. It also sets up the system variables to start playing the tune. Before this command is called the registers $D0 and $D1 (208 and 209) should be set to contain the low and high byte respectively of the start of the tune. If the Synthesiser and the tune are in their normal positions type:

POKE 208,0:POKE 209,20:SYS 4096 to start the tune.

Lines 10400-10500 turn the Synthesiser off. This redirects the keyboard interrupt vector to its normal value of $CE0E located in the ROM. Turning the Synthesiser on again means that it carries on from where it left off.

Lines 10600-10700 is where the program is called every 1/50th second. If it is time for a new note, it will jump to line 10910.

Lines 10730-10800 control the envelope of the sound, assuming waveform sound has been selected. Line 10810 jumps back into the keyboard routine.

Lines 10900-11110 read the next command (three bytes) into memory and move the pointer on three bytes.

If the first byte of the three is between $00 and $F3 it treats this byte as a duration and the next two bytes as a pitch for a note in channel one. If the first byte is between $F4 and $FF however, it treats the three bytes as a command and acts upon each as follows:

Lines 11200-11260 Command: OFF.
First byte $FF; compiler command OF; format OF,0
This turns the tune off. Make sure to include one of these at the end of the tune.

Lines 11265-11380 Command: GOSUB/GOTO
First byte $FE; compiler command GO; format GO,label
This is a type of GOSUB instruction. It jumps to the address stored in the frequency bytes. It also stores the old pointer address in memory allowing the tune to return, so that tunes can save subroutines although nesting is not allowed. This can also be used as a GOTO instruction.

Lines 11390-11470 Command: RETURN
First byte $FD; compiler command RE; format RE,0
This is the return instruction which makes the Synthesiser resume after the last GOSUB instruction. As with a number of these instructions the frequency bytes must be present but are not used. They can have any value, preferably zero.

Lines 11480-11580 Command: VOLUME
First byte $FC; Compiler command VO; Format VO,0-8
This can be used to change the volume inside a tune.

Lines 11600-11700 Command: Set 2nd channel
First byte $FB; Compiler command S2; format S2,2 or 3
The second channel can be either noise or music; two for

music and three for noise as per C-16 SOUND command.

Lines 11800-11900 Command: 2nd channel deviation
First byte $FA; Compiler command DE; format DE,0-65535
This sets the deviation of the second channel for chorusing as explained earlier. Any value greater than zero will make the second channel play automatically with channel one, adding the deviation to the pitch. Note that the command DE,1 adds one to the pitch and that DE,5535 subtracts one from the pitch. Large values such as DE,40 make channel two sound completely off key. DE,0 turns off deviation mode.

Lines 12000-12070 Command: OFF 2nd channel
First byte $F9; Compiler command X2; format X2,0
Switches channel two off.

Lines 12100-12250 Command: 2nd channel
First byte $FB; Compiler command C2; format C2,0-1024
This turns the second channel on using the pitch in the two frequency bytes and the duration set up by the Set Interval command.

Lines 12300-12470 Command: Set Interval
First byte $F7; Compiler command SI; format SI,0-65535
This alters the duration of the second channel in 1/50th second steps. The command SI,0 will make channel two play continuously after being turned on.

Lines 12500-12660 Command: ON/OFF waveform sound
First byte $F6; Compiler command TW; format TW,0 or 1
Turns waveform sound on/off. TW,1 turns on waveform sound storing the previous volume level. TW,0 turns off waveform sound restoring volume level.

Lines 12700-12760 Command: Set wave number
First byte $F5; Compiler command WA; format WA,0-255
This selects the waveform to be used. The number is the high byte of the start address of the waveform. In its normal mode there are two waveforms available: WA,18 and WA,19.

Lines 12800-12860 Command: Jump to user routine
First byte $F4; Compiler command MC, format MC,0-255

Figure 3

PROGRAM: SYNTHDATA

```
10000 A=4096:DO:B=0:FORC=1TO1
6:READD:IFD=-1THENPRINT"OK.."
:END
10010 B=B+D:POKEA,D:A=A+1:NEX
T:READD
10020 IFD<>BTHENPRINT"DATA ER
ROR IN LINE";PEEK(63)+256*PEE
K(64):END:ELSELOOP
20000 DATA 120,169,66,141,20,
3,169,16,141,21,3,169,32,133,
215,169, 1587
20010 DATA 0,133,218,133,224,
133,225,133,220,133,221,173,1
7,255,41,127, 2386
20020 DATA 141,17,255,169,254
,141,252,4,141,254,4,88,96,12
0,173,17, 2126
20030 DATA 255,41,143,141,17,
255,169,14,141,20,3,169,206,1
41,21,3, 1739
20040 DATA 88,96,173,252,4,20
1,255,240,21,165,224,240,14,1
60,0,173, 2306
20050 DATA 17,255,41,240,17,2
22,141,17,255,230,222,76,14,2
06,165,225, 2343
20060 DATA 240,12,173,17,255,
5,225,141,17,255,169,0,133,22
5,160,0, 2027
20070 DATA 162,0,177,208,149,
210,200,232,138,201,3,208,245
,165,208,105, 2611
```

This allows the user to create extra commands for the synthesiser. One of its most important uses would be to call a routine which sets a flag to signify when the tune has reached that point so that an arcade game could be synchronised with the tune. At the start of each routine make sure you disable interrupts (SEI) and enable them (CLI) at the end of the routine. Use RTS to return to the Synthesiser. This is the only routine in the Synthesiser which cannot be easily relocated because of the JSR to a fixed address in line 12830.

Lines 12800-13060 Command: Pause A11
First byte $F3; Compiler command PA; format PA,1-255
This pauses both channels from 1/50th second to 20 minutes. If the backing was on before the pause it will be on again after the pause.

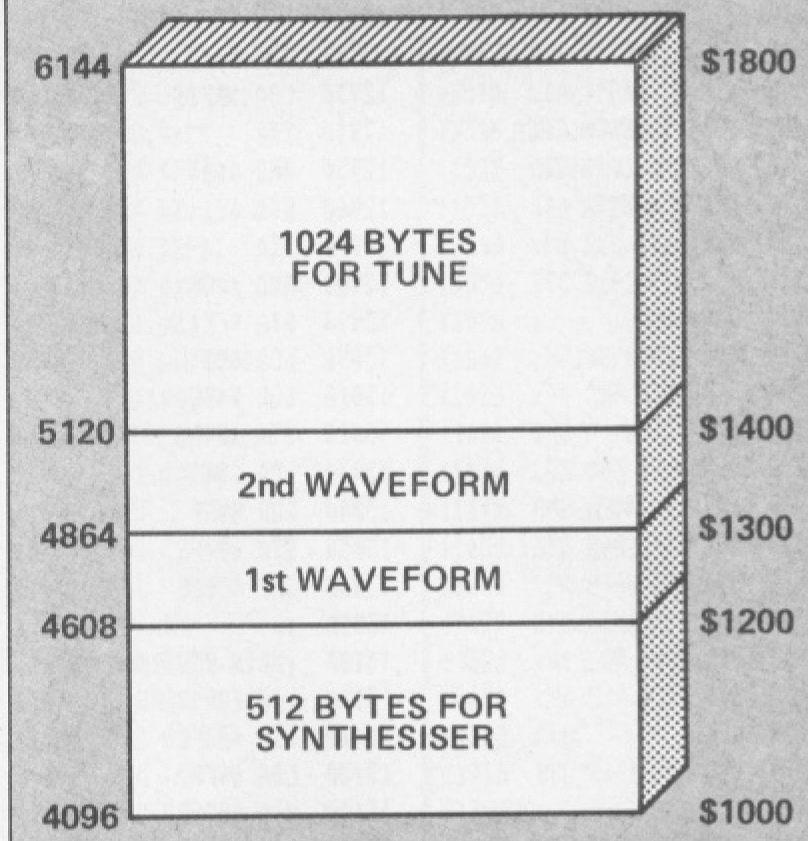


Figure 4: Memory map

Lines 13000-13500
This is the main routine for notes going to channel one. If the deviation is on it also sets up channel two.

The Compiler

One of the greatest improvements over the original PLAY command routine is the inclusion of a special two-pass music compiler which greatly simplifies the problems of composing music. The music compiler listing is shown in Figure 5. The Hovis advertisement demo for the PLAY command was very difficult to write because I had to work out the addresses for the GOSUB values and look up the numbers for commands such as Volume, etc. The music compiler eliminates the need for any of this. GOSUBs and GOTOs are made much easier by the use of labels. The letters LA signify that a label is to follow and the label follows directly after a separating comma. Up to 50 labels can be used, which should be enough for even the longest tune. If more are required however, change the number inside the DIM statement in line 45010 to the desired value. Also, instead of having to quote the number of the command you want, e.g. 252 for volume, you simply write VO followed by the volume number. The compiler, when run, will translate the VO into 252. Finally there should be an END instruction. An infinitely repeating beginning to Three Blind Mice would therefore look like this:

DATA,LA,START,VO,7 start label and a volume 7 command.
DATA 20,685,20,643,40,596,GO, LA,START,END

Play the notes in channel one and then loop back to the label called START. Tunes are now so much easier to read, write and edit that a good deal of enjoyment should be had in composing the tune.

To compile the tune type RUN45000. As the compiler sets the pointer to the start of the tune, to start the tune playing simply type SYS4096 provided the synthesiser is at its normal position. To stop the tune type SYS4141. It is possible to compile the tune to anywhere in memory simply by changing the value of the variable D in line 45000 to the desired value.

Figure 5

PROGRAM: COMPILER

```
45000 D=DEC("1400"):SYS4141:POKE208,0:POKE209,INT(D/256)
45010 DIMA$(50):DIMD%(50)
45020 A=D:RESTORE50000
45030 READB$:IFB$="LA"THENREADB$:A$(E)=B$:D%(E)=A:E=E+1:GOTO45030
45040 IFB$="END"THENGOTO45100
45050 READC$:IFC$="LA"THENREADC$
45060 A=A+3:GOTO45030
45100 A=D:RESTORE50000
45110 READB$:IFB$="END"THENPRINT"OK...":END
45115 IFB$="LA"THENREADB$:GOTO45110
45120 IFASC(B$)<65THENB=VAL(B$):GOTO45125
45122 B=256-((INSTR("OFGOREVOS2DEX2C2SITWWAMCPA",B$)+1)/2)
45123 IFB=255.5THENPRINTB$"?INVALID COMMAND":END
45125 POKEA,B:READC$:IFC$<>"LA"THENC=VAL(C$):GOTO45150
45130 READB$:FORF=0TOE:IFA$(F)=B$THENC=D%(F):GOTO45150
45140 NEXT:PRINT"LABEL NOT FOUND IN ":END
45150 POKEA+1,C-(INT(C/256)*256):POKEA+2,INT(C/256):A=A+3:GOTO45110
20080 DATA 2,133,208,144,2,230,209,165,210,201,255,208,6,32,45,16, 2066
20090 DATA 24,144,200,201,254,208,19,165,208,133,213,165,211,133,208,165, 2651
20100 DATA 209,133,214,165,212,133,209,24,144,180,201,253,208,11,165,213, 2674
20110 DATA 133,208,165,214,133,209,24,144,165,201,252,208,13,173,17,255, 2514
20120 DATA 41,240,5,211,141,17,255,24,144,148,201,251,208,17,165,211, 2279
20130 DATA 201,2,240,4,169,64,208,2,169,32,133,215,24,144,232,201, 2040
20140 DATA 250,208,16,165,211,133,216,165,212,133,217,5,211,133,218,208, 2701
20150 DATA 214,240,4,201,249,208,11,173,17,255,41,159,141,17,255,24, 2209
20160 DATA 144,197,201,248,208,32,165,211,141,15,255,165,212,141,16,255, 2606
20170 DATA 165,220,141,253,4,165,221,141,255,4,173,17,255,41,159,5, 2219
20180 DATA 215,141,17,255,208,161,201,247,208,27,165,211,5,212,208,6, 2487
20190 DATA 133,220,133,221,240,202,165,211,73,255,133,220,165,212,73,255, 2911
20200 DATA 133,221,24,144,187,201,246,208,29,165,211,133,224,208,13,173, 2520
20210 DATA 17,255,41,240,5,219,141,17,255,24,144,164,173,17,255,41, 2008
20220 DATA 15,133,219,24,144,154,201,245,208,7,165,211,133,223,24,144, 2250
20230 DATA 143,201,244,208,9,32,123,17,24,144,133,108,211,0,201,243, 2041
20240 DATA 208,31,173,17,255,170,41,96,133,225,138,41,143,141,17,255, 2084
20250 DATA 165,211,73,255,141,252,4,165,212,73,255,141,254,4,76,14, 2295
20260 DATA 206,73,255,141,252,4,169,255,141,254,4,169,0,133,222,165, 2443
20270 DATA 211,5,212,208,11,173,17,255,41,239,141,17,255,76,14,206, 2081
20280 DATA 173,18,255,41,252,5,212,141,18,255,165,211,141,14,255,173, 2329
20290 DATA 17,255,9,16,141,17,255,165,218,240,226,24,165,211,101,216, 2276
20300 DATA 141,15,255,165,212,101,217,141,16,255,173,17,255,5,215,141, 2324
20310 DATA 17,255,165,220,141,253,4,165,221,141,255,4,76,14,206,255, 2392,-1
```

Figure 6

PROGRAM: DEMO TUNES

```
45000 D=DEC("1400"):SYS4141:POKE208,0:POKE209,INT(D/256)
45010 DIMA$(50):DIMD%(50)
45020 A=D:RESTORE50000
45030 READB$:IFB$="LA"THENREADB$:A$(E)=B$:D%(E)=A:E=E+1:GOTO45030
45040 IFB$="END"THENGOTO45100
45050 READC$:IFC$="LA"THENREADC$
45060 A=A+3:GOTO45030
45100 A=D:RESTORE50000
45110 READB$:IFB$="END"THENPRINT"OK...":END
45115 IFB$="LA"THENREADB$:GOTO45110
45120 IFASC(B$)<65THENB=VAL(B$):GOTO45125
45122 B=256-((INSTR("OFGOREVOS2DEX2C2SITWWAMCPA",B$)+1)/2)
45123 IFB=255.5THENPRINTB$"?INVALID COMMAND":END
45125 POKEA,B:READC$:IFC$<>"LA"THENC=VAL(C$):GOTO45150
45130 READB$:FORF=0TOE:IFA$(F)=B$THENC=D%(F):GOTO45150
45140 NEXT:PRINT"LABEL NOT FOUND IN ":END
45150 POKEA+1,C-(INT(C/256)*256):POKEA+2,INT(C/256):A=A+3:GOTO45110
50000 REM DEMONSTRATION TUNES
50002 REM
50003 REM WHEN THE SAINTS GO MARCHING IN
50004 REM
50005 DATALA,START,DE,0,TW,0,VO,5,GO,LA,SAINTS,WA,18,TW,1,GO,LA,SAINTS,TW,0,DE,2
50010 DATAGO,LA,SAINTS,TW,1,GO,LA,SAINTS,PA,100,GO,LA,JOESTHEME
50100 DATALA,SAINTS,12,596,12,685,12,704,48,739,12,596,12,685,12,704,48,739
50110 DATA12,596,12,685,12,704,24,739,24,685,24,596,24,685,60,643
50120 DATA12,685,12,685,12,643,48,596,24,685,24,739,12,739,48,704,12,685,12,704
50130 DATA24,739,24,685,24,596,24,643,48,596,RE,0
50470 REM
50480 REM JOE'S THEME
50490 REM
50500 DATALA,JOESTHEME,TW,0,0,7,DE,2,GO,LA,JOE,DE,0,GO,LA,JOE,PA,100,GO,LA,HOVIS
50510 DATALA,JOE,C2,345,30,6[illegible]5,10,704,20,739,C2,169,20,596
50520 DATAC2,383,30,704,10,739,20,770,C2,262,20,643
50530 DATAC2,383,30,704,10,739,20,770,C2,262,20,643
50540 DATAC2,453,30,739,10,770,40,798
50550 DATAC2,453,30,739,10,770,20,798,C2,345,20,685
50560 DATAC2,516,30,770,10,798,20,810,PA,20
50570 DATAC2,811,20,810,C2,799,20,798,C2,771,30,770
50580 DATA10,739,30,770,10,739,10,770
50590 DATAC2,453,30,739,10,704,10,685,10,643,C2,169,40,596,RE,0
50970 REM
50980 REM ANTONIN DVORAK'S LARGO
50990 REM
51000 DATALA,HOVIS,X2,0,TW,1,GO,LA,LARG1,GO,LA,LARG2,GO,LA,LARG2,GO,LA,LARG1
51010 DATADE,2,GO,LA,LARG1,GO,LA,LARG2,GO,LA,LARG2,GO,LA,LARG1,OF,1
51100 DATALA,LARG1,20,685,20,739,40,739,20,685,20,643,40,596,20,643,20,685
51110 DATA20,739,20,685,80,643,20,685,20,739,40,739
51120 DATA20,685,20,643,40,596,20,643,20,685,20,643
51130 DATA20,596,80,596,RE,0
51150 DATALA,LARG2,20,770,20,810,40,810,20,796,20,739,40,770
51160 DATA20,770,20,810,20,798,20,739,80,770,RE,0
51200 DATAEND
54970 REM
54980 REM SAMPLE WAVEFORM USED IN DEMO.
54990 REM
55000 RESTORE55010:FORA=4608TO4653:READB:POKEA,B:NEXT:FORA=4654TO4863:POKEA,2:NEXT:END
55010 DATA1,2,2,3,4,4,5,6,6,7,8,8,7,7,6,6,5,5,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4,4
55020 DATA3,3,3,3,3,3,3,3,3,3
```

Figure 6 shows some demonstration tunes. Lines 5000-5020 create a simple waveform at address 4608 to start you going. Run 55000 before playing the tunes. The demonstrations include such immortal classics as the Saints, Joe's theme and Dvorak's New World Symphony. No imagination has been spared here, in fact these tunes do to music what Rolf Harris's Picture Builder did to art. I'm sure you can do better.

The Waveform Editor

The Waveform editor (Figure 7) allows the user to create and modify waveforms. Run the program and enter the waveform number (decimal high byte of the address of the waveform) then type C or E and return in response to Create or Edit or waveform? If you want to create a waveform the list of numbers will all be reset to zero. If you want to edit a waveform all the numbers greater than eight will be clipped to eight to avoid any errors in the operation of the Synthesiser. The screen is then cleared and the first page of the waveform is displayed with volume settings zero to eight on the vertical axis. The cursor will flash at the first position of the waveform. Move left and right using the cursor controls and press keys zero to eight to set the volume. Page one displays the first 80 bytes of the waveform. To move to the second line of the display press cursor down. There are three pages to cover 240 bytes of the waveform. Moving the cursor down off the bottom of the page will enter the next page of 80 bytes.

There are other functions in the editor which help to make things simpler. Pressing shift/P will start the synthesiser playing at the beginning, assuming the synthesiser and tune are stored at the normal positions. If they are at different addresses change the values of the first two POKEs and the SYS in line 20600 accordingly.

If a tune is stored which turns on waveform sound, but does not select a particular waveform, the synthesiser will use the waveform which is being edited at the time – hence any change in the waveform will have an immediate effect and you can set it up by ear!

Other Commands

Pressing shift/X at any time will turn off the tune.
Pressing shift/R will restart the program enabling you to change waveforms.
Pressing Q will quit the editor when you are satisfied with the waveform. This also sets the last 16 bytes of the waveform to the last value at the end of page three.
Shift W (wipe) will set the volume of all values to the right of the cursor to the cursor value and completes the waveform at a constant level.



Figure 7

PROGRAM: WAVE EDITOR

```
20000 SCNCLR:PRINT"        WAVE
FORM EDITOR",,"     [c U][c
U][c U][c U][c U][c U][c U][c
 U][c U][c U][c U][c U][c U][
c U][c U]"
20010 INPUT"WAVEFORM NUMBER";
A:B=A*256:INPUT"CREATE (C) OR
 EDIT (E) WAVEFORM";A$
20020 D=0:IFA$="C"THENFORC=BT
OB+255:POKEC,0:NEXT
20030 IFA$<>"E"THEN20100:ELSE
FORC=BTOB+255:IFPEEK(C)>8THEN
POKEC,8
20040 NEXT
20100 SCNCLR:FORC=1TO2:PRINT"
[DOWN][DOWN][DOWN][DOWN][DOWN
][DOWN][DOWN][DOWN][c @][c @]
[c @][c @][c @][c @][c @][c @
][c @][c @][c @][c @][c @][c
@][c @][c @][c @][c @][c @][c
 @][c @][c @][c @][c @][c @][
c @][c @][c @][c @][c @][c @]
[c @][c @][c @][c @][c @][c @
][c @][c @][c @]":NEXT
20200 E=B+(D*80):FORF=0TO1:FO
RG=0TO39:H=(8-PEEK(E+40*F+G))
*40+G+360*F:POKE2048+H,82
20210 POKE3072+H,86:NEXT:NEXT
20250 PRINT:PRINT"WAVEFORM NU
MBER "A"   ADDRESS "B,"PAGE"D
+1
20500 F=P-(80*D):G=((8-PEEK(B
+P))*40)+F-(INT(F/40)*40):F=(
INT(F/40)*360)+G
20510 POKEF+2048,145:POKE3072
+F,86
20550 GETKEYA$:POKE2048+F,82
20560 IFP>0ANDA$="[LEFT]"THEN
P=P-1:GOTO20800
20570 IFP<239ANDA$="[RIGHT]"T
HENP=P+1:GOTO20800
20580 IFA$="[UP]"ANDP>39THENP
=P-40
20590 IFA$="[DOWN]"ANDP<200TH
ENP=P+40
20600 IFA$="[s P]"THENPOKE208
,0:POKE209,20:POKE223,A:SYS40
96
20610 IFA$="[s X]"THENSYS4141
20620 IFA$="[s R]"THENRUN2000
0
20630 IFA$="[s W]"THENH=B+P:F
ORG=H+1TOB+255:POKEG,PEEK(H):
NEXT:GOTO20100
20640 IFA$="Q"THENFORG=241TO2
55:POKEB+G,PEEK(B+240):NEXT:P
RINT"OK..":END
20700 IFA$<"0"ORA$>"8"THEN208
00
20710 IFPEEK(B+P)=0THENPOKE30
72+F,100:POKE2048+F,16:ELSEPO
KE3072+F,32
20720 POKE(B+P),VAL(A$)
20800 G=D:D=INT(P/80):IFG<>DT
HEN20100:ELSE20500
```

Telephone EXCHANGE

Part two of our communications program from K Otton and A Adams.

Main Menu

F3 – Set up Message Screen – will provide you with a blank screen on which you can pre-type a messge or draw one using the dots, dashes, stars etc. available in ASCII. When you have typed the message you can then go on line (F2) from Main Menu. When you need to send your message just press F5. The message can be sent as many times as you like.

F4 enables you to view saved screens. When off or on line you may re-load a saved screen by pressing F4. You will be asked if you need a Directory (disk only) or to enter the name which you used to save the screens when on line. After the screen has loaded you will have the option to print the screen or go back to Main Menu.

F5 – Create Board File – is like a small data base. When you have information such as name, telephone no., baud rate, parity etc. It can be typed in and saved as a file.

F6 is Load/View Board File. Follow the Screen Prompts and this will load the stored information into memory and set the Baud Rate etc. ready to go on line.

Loading F7 – Load Saved File (Buffer) – allows you to view or print all or some of the file you saved when you opened the Buffer (F3). This is OK apart from the fact that there is no error check on this version. However, it has proved to be pretty reliable on most transfers. When the file is printing to the screen you can stop the scrolling by using the space bar. Pressing the bar again will re-start output. You cannot stop the output to the printer once it has started. Again, hitting the back arrow will return to Main Menu.

Macro

Macro, or answer back as some people might know it, is an automatic demand to identify the caller. The host computer will send a control character which will make your computer send the required information. Not all Boards use this Function and not all Boards

```
2320 DATA 32,32,32,32,32,32,
   32,54,32,66,9,20,19,46,46,
   46,562
2330 DATA 46,46,46,46,46,46,
   46,46,70,53,32,32,32,32,
   32,42,693
2340 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,53,543
2350 DATA 32,66,9,20,19,46,
   46,46,46,46,46,46,46,46,
   46,46,652
2360 DATA 70,55,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,593
2370 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2380 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,42,522
2390 DATA 42,32,32,83,20,15,
   16,32,66,9,20,19,32,32,32,
   32,514
2400 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2410 DATA 32,32,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,532
2420 DATA 32,32,32,32,32,32,
   32,49,32,83,20,15,16,32,
   66,9,546
2430 DATA 20,19,46,46,46,46,
   46,46,70,49,32,32,32,32,
   32,42,636
2440 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,50,540
2450 DATA 32,83,20,15,16,32,
   66,9,20,19,46,46,46,46,46,
   46,588
2460 DATA 70,51,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,589
2470 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2480 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,42,522
2490 DATA 42,32,32,68,5,6,1,
   21,12,20,32,20,15,32,32,
   51,421
2500 DATA 48,48,47,56,47,49,
   46,46,46,46,46,46,46,46,
   46,46,755
2510 DATA 70,55,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,593
2520 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2530 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,42,522
2540 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,522
```

```
2550 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2560 DATA 32,32,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,532
2570 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2580 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,42,522
2590 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,522
2600 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2610 DATA 32,32,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,532
2620 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2630 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,42,522
2640 DATA 42,42,42,42,42,42,
   42,42,42,42,42,42,42,42,
   42,42,672
2650 DATA 42,42,42,42,42,42,
   42,42,42,42,42,42,42,42,
   42,42,672
2660 DATA 42,42,42,42,42,42,
   42,42,70,0,0,0,0,0,18,0,
   424
2670 DATA 70,0,0,0,0,0,18,0,
   70,0,0,0,0,0,18,0,176
2680 DATA 42,42,42,42,42,42,
   42,42,42,42,42,42,42,42,
   42,42,672
2690 DATA 42,42,42,42,42,42,
   42,42,42,42,42,42,42,42,
   42,42,672
2700 DATA 42,42,42,42,42,42,
   42,42,42,32,32,32,32,32,
   32,32,602
2710 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2720 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,42,522
2730 DATA 42,62,32,72,1,14,4,
   32,83,8,1,11,9,14,7,32,424
2740 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2750 DATA 32,32,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,532
2760 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2770 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,42,522
2780 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,51,541
2790 DATA 32,76,9,14,5,46,46,
   46,46,46,46,46,46,46,46,
   46,642
2800 DATA 70,49,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,587
2810 DATA 32,32,32,32,32,32,
   32,88,15,14,47,88,15,6,6,
   46,549
2820 DATA 46,46,46,46,46,46,
   46,46,70,51,32,32,32,32,
   32,42,691
2830 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,522
2840 DATA 32,0,170,0,170,0,
   170,0,170,0,170,0,170,0,
   170,0,1222
4000 PRINT"[CLEAR]NEW"
   :PRINT"[DOWN2]
   LOAD"+CHR$(34)+"COMMS GEN
   5"+CHR$(34)+",8"
4005 REM ** CHANGE ,
   8 IN ABOVE LINE TO ,1 IF
    YOU ARE USING TAPE **
4010 PRINT"[DOWN4]RUN"
4020 POKE 631,13:POKE 632,13
   :POKE 633,13:POKE 198,3
   :PRINT"[HOME]"
```

PROGRAM: COMMS GEN5

```
2000 FOR L=0 TO 175:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 9472+L*16+D,
   A:NEXT D
2010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2040+(L*10):STOP
2020 NEXT L
2040 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2050 DATA 32,32,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,532
2060 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2070 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,42,522
2080 DATA 42,32,32,80,1,18,9,
   20,25,32,32,32,32,32,32,
   32,483
2090 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2100 DATA 32,32,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,532
2110 DATA 32,32,32,32,32,32,
   32,78,15,14,5,46,46,46,46,
   46,566
2120 DATA 46,46,46,46,46,46,
   46,46,70,49,32,32,32,32,
   32,42,689
2130 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,79,569
2140 DATA 4,4,46,46,46,46,46,
   46,46,46,46,46,46,46,46,
   46,652
2150 DATA 70,50,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,588
2160 DATA 32,32,32,32,32,32,
   32,69,22,5,14,46,46,46,46,
   46,564
2170 DATA 46,46,46,46,46,46,
   46,46,70,51,32,32,32,32,
   32,42,691
2180 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,78,568
2190 DATA 15,14,5,40,13,1,18,
   11,41,46,46,46,46,46,46,
   46,480
2200 DATA 70,52,32,32,32,32,
   32,42,42,32,32,32,32,32,
   32,32,590
2210 DATA 32,32,32,32,32,32,
   32,78,15,14,5,40,19,16,1,
   3,415
2220 DATA 5,41,46,46,46,46,
   46,46,70,53,32,32,32,32,
   32,42,647
2230 DATA 42,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,522
2240 DATA 32,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,512
2250 DATA 32,32,32,32,32,32,
   32,42,42,32,32,68,21,16,
   12,5,494
2260 DATA 24,32,32,32,32,32,
   32,32,32,32,32,32,32,32,
   32,32,504
```

▶

use the same format. When you log on to a particular Board, it will tell you if this function is available and in what format.

Getting it all in

There are nine different parts to the Telecom program. Enter all parts separately and save on to disk or tape. If you are using tape then you do not need the boot generator program also, if you are using tape make sure that you make all the changes as indicated in the REM statements. Cassette users should save the programs COMMS GEN1 to 5 on the same cassette one after the other.

When you have entered and SAVEd all parts then LOAD and RUN the BASIC MOVE program.

Now LOAD 'COMMS GEN1' and RUN. This will automatically LOAD in parts 2 to 5 as needed. If you are using cassette then place a new cassette in the unit as soon as part 5 has finished loading. When 'COMMS GEN5' has finished LOADing it will SAVE '1TELCOM/v1' to tape or disk.

Next switch off and on your machine and LOAD 'COMMS GEN6' and RUN. This will LOAD part 7 when needed. Cassette users should place the cassette that contains '1TELCOM/V1' in the unit as soon as part 7 has loaded. Part 7 will SAVE '2TELCOM/v1' to tape or disk when finished.

You should now have two programs '1TELCOM/V1' and '2TELCOM/V1' these are the complete program. In future if you want to use the program simply type:

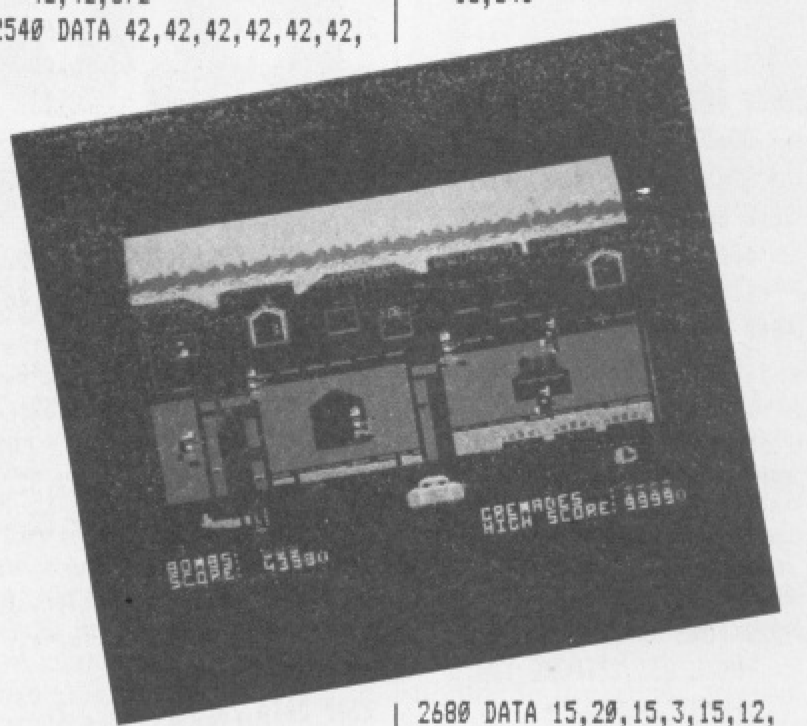
```
LOAD "1TELCOM/V1",8,1
LOAD "2TELCOM/V1",8,1

SYS 52224
```

and the program will start. If you are using tape then change the ,8,1 in the above lines to ,1,1.

Disk users have the added advantage of an auto boot program. LOAD and RUN the BOOT GENERATOR program and COMMS BOOT will be saved to your disk. In future to use the program type LOAD "COMMS BOOT",8,1 and the program will auto run.

```
2270 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2280 DATA 42,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,70,560
2290 DATA 21,12,12,46,46,46,
  46,46,46,46,46,46,46,46,
  46,46,643
2300 DATA 70,49,32,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,587
2310 DATA 32,32,32,32,32,32,
  32,72,1,12,6,46,46,46,46,
  46,545
2320 DATA 46,46,46,46,46,46,
  46,46,70,51,32,32,32,32,
  32,42,691
2330 DATA 42,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,522
2340 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2350 DATA 32,32,32,32,32,32,
  32,42,42,32,32,68,5,6,1,
  21,473
2360 DATA 12,20,32,20,15,32,
  51,76,9,14,5,47,70,21,12,
  12,448
2370 DATA 47,78,15,14,5,46,
  46,46,70,55,32,32,32,32,
  32,42,624
2380 DATA 42,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,522
2390 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2400 DATA 32,32,32,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,532
2410 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2420 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2430 DATA 42,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,522
2440 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2450 DATA 32,32,32,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,532
2460 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2470 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2480 DATA 42,42,42,42,42,42,
  42,42,42,42,42,42,42,42,
  42,42,672
2490 DATA 42,42,42,42,42,42,
  42,42,42,42,42,42,42,42,
  42,42,672
2500 DATA 42,42,42,42,42,42,
  42,42,70,0,0,0,0,0,18,0,
  424
2510 DATA 70,0,0,0,0,0,18,0,
  70,0,0,0,0,0,18,0,176
2520 DATA 42,42,42,42,42,42,
  42,42,42,42,42,42,42,42,
  42,42,672
2530 DATA 42,42,42,42,42,42,
  42,42,42,42,42,42,42,42,
  42,42,672
2540 DATA 42,42,42,42,42,42,
  42,42,42,32,32,32,32,32,
  32,32,602
2550 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2560 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2570 DATA 42,32,32,32,32,32,
  32,32,32,32,32,32,42,42,
  32,77,587
2580 DATA 1,9,14,32,77,5,14,
  21,32,42,42,32,32,32,32,
  32,449
2590 DATA 32,32,32,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,532
2600 DATA 32,32,32,32,32,32,
  32,45,45,45,45,32,45,45,
  45,45,616
2610 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2620 DATA 42,32,32,32,70,21,
  14,3,20,9,15,14,32,32,32,
  32,432
2630 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2640 DATA 32,75,5,25,32,32,
  32,42,42,32,32,32,32,32,
  32,32,541
2650 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2660 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2670 DATA 42,32,32,32,32,60,
  49,62,32,32,83,5,20,32,80,
  18,643
2680 DATA 15,20,15,3,15,12,
  40,66,1,21,4,82,1,20,5,41,
  361
2690 DATA 46,70,49,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,601
2700 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2710 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2720 DATA 42,32,32,32,32,60,
  50,62,32,32,71,15,32,84,
  15,32,655
2730 DATA 84,5,18,13,9,14,1,
  12,32,77,15,4,5,46,46,46,
  427
2740 DATA 46,70,50,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,602
2750 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2760 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2770 DATA 42,32,32,32,32,60,
  51,62,32,32,83,5,20,32,85,
  16,648
2780 DATA 32,77,5,19,19,1,7,
  5,32,83,3,18,5,5,14,46,37
2790 DATA 46,70,51,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,603
2800 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2810 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2820 DATA 42,32,32,32,32,60,
  52,62,32,32,86,9,5,23,32,
  83,646
2830 DATA 1,22,5,4,32,83,3,
  18,5,5,14,19,46,46,46,46,
  395
2840 DATA 46,70,52,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,604
2850 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2860 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2870 DATA 42,32,32,32,32,60,
  53,62,32,32,67,18,5,1,20,
  5,525
2880 DATA 32,66,15,1,18,4,32,
  70,9,12,5,46,46,46,46,46,
  494
2890 DATA 46,70,53,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,605
2900 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,32,512
2910 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
  32,42,522
2920 DATA 42,32,32,32,32,60,
  54,62,32,32,76,15,1,4,32,
  47,585
2930 DATA 32,86,9,5,23,32,66,
  15,1,18,4,32,70,9,12,5,419
2940 DATA 46,70,54,32,32,32,
  32,42,42,32,32,32,32,32,
  32,32,606
2950 DATA 32,32,32,32,32,32,
  32,32,32,32,32,32,32,32,
```



```
32,32,512
2960 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
2970 DATA 42,32,32,32,32,60,55,62,32,32,70,9,12,5,32,76,615
2980 DATA 15,1,4,32,86,9,5,23,47,80,18,9,14,20,32,63,458
2990 DATA 46,70,55,32,32,32,32,42,42,32,32,32,32,32,32,32,607
3000 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3010 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3020 DATA 42,32,32,32,32,60,56,62,32,32,70,1,3,9,12,9,516
3030 DATA 20,25,32,83,3,18,5,5,14,46,46,46,46,46,46,46,527
3040 DATA 46,70,56,32,32,32,32,42,42,32,32,32,32,32,32,32,608
3050 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3060 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3070 DATA 42,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,522
3080 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3090 DATA 32,32,32,32,32,32,32,42,42,32,32,32,32,32,32,32,532
3100 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3110 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3120 DATA 42,42,42,42,42,42,42,42,42,42,42,42,42,42,42,42,672
3130 DATA 42,42,42,42,42,42,42,42,42,42,42,42,42,42,42,42,672
3140 DATA 42,42,42,42,42,42,42,42,70,0,0,0,0,0,0,18,0,424
3150 DATA 70,0,0,0,0,0,18,0,70,0,0,0,0,0,18,0,176
3160 DATA 42,42,42,42,42,42,42,42,42,42,42,42,42,42,42,42,672
3170 DATA 42,42,42,42,42,42,42,42,42,42,42,42,42,42,42,42,672
3180 DATA 42,42,42,42,42,42,42,42,42,32,32,32,32,32,32,32,602
3190 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3200 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3210 DATA 42,32,32,32,32,32,32,32,32,32,32,32,42,42,32,70,580
3220 DATA 1,3,9,12,9,20,9,5,19,32,42,42,32,32,32,32,331
3230 DATA 32,32,32,32,32,32,32,42,42,32,32,32,32,32,32,32,532
3240 DATA 32,32,32,32,32,32,32,45,45,45,45,45,45,45,45,45,629
3250 DATA 45,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,535
3260 DATA 42,32,32,32,70,21,14,3,20,9,15,14,32,32,32,32,432
3270 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3280 DATA 32,75,5,25,32,32,32,42,42,32,32,32,32,32,32,32,541
3290 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3300 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3310 DATA 42,32,32,32,32,60,49,62,32,32,80,18,9,14,20,5,551
3320 DATA 18,32,68,5,22,32,180,47,54,46,46,46,46,46,46,46,780
3330 DATA 46,70,49,32,32,32,32,42,42,32,32,32,32,32,32,32,601
3340 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3350 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3360 DATA 42,32,32,32,32,60,50,62,32,32,196,137,147,139,32,15,1072
3370 DATA 18,32,84,1,16,5,46,46,46,46,46,46,46,46,46,46,616
3380 DATA 46,70,50,32,32,32,32,42,42,32,32,32,32,32,32,32,602
3390 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3400 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3410 DATA 42,32,32,32,32,60,51,62,32,32,73,14,3,32,83,3,615
3420 DATA 18,5,5,14,32,67,15,12,46,46,46,46,46,46,46,46,536
3430 DATA 46,70,51,32,32,32,32,42,42,32,32,32,32,32,32,32,603
3440 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3450 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3460 DATA 42,32,32,32,32,60,52,62,32,32,73,14,3,32,66,15,611
3470 DATA 18,4,5,18,32,67,15,12,46,46,46,46,46,46,46,46,539
3480 DATA 46,70,52,32,32,32,32,42,42,32,32,32,32,32,32,32,604
3490 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3500 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3510 DATA 42,32,32,32,32,60,53,62,32,32,73,14,3,32,67,21,619
3520 DATA 18,19,15,18,32,67,15,12,46,46,46,46,46,46,46,46,564
3530 DATA 46,70,53,32,32,32,32,42,42,32,32,32,32,32,32,32,605
3540 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3550 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3560 DATA 42,32,32,32,32,60,54,62,32,32,66,5,12,12,32,207,744
3570 DATA 142,47,79,6,6,46,46,46,46,46,46,46,46,46,46,46,786
3580 DATA 46,70,54,32,32,32,32,42,42,32,32,32,32,32,32,32,606
3590 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3600 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3610 DATA 42,32,32,32,32,60,55,62,32,32,85,14,21,19,5,4,559
3620 DATA 46,46,46,46,46,46,46,46,46,46,46,46,46,46,46,46,736
3630 DATA 46,70,55,32,32,32,32,42,42,32,32,32,32,32,32,32,607
3640 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3650 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3660 DATA 42,32,32,32,32,60,56,62,32,32,82,5,20,21,18,14,572
3670 DATA 32,77,1,9,14,32,77,5,14,21,46,46,46,46,46,46,558
3680 DATA 46,70,56,32,32,32,32,42,42,32,32,32,32,32,32,32,608
3690 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3700 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,42,522
3710 DATA 42,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,522
3720 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3730 DATA 32,32,32,32,32,32,32,42,42,32,32,32,32,32,32,32,532
3740 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,32,512
3750 DATA 32,32,32,32,32,32,32,32,32,32,32,32,32,32,
```

```
   32,42,522
3760 DATA 42,42,42,42,42,42,
   42,42,42,42,42,42,42,42,
   42,42,672
3770 DATA 42,42,42,42,42,42,
   42,42,42,42,42,42,42,42,
   42,42,672
3780 DATA 42,42,42,42,42,42,
   42,42,255,255,255,255,255,
   255,255,255,2376
3790 DATA 32,32,32,32,32,32,
   32,32,0,32,0,0,0,32,45,61,
   426
4000 REM ** SAVE PT 1 **
4010 POKE 43,0:POKE 44,8
   :POKE 45,0:POKE 46,48
4015 REM ** CHANGE ,
   8 IN NEXT LINE TO ,1 IF
    USING TAPE **
4020 SAVE "1TELCOM/V1",8
```

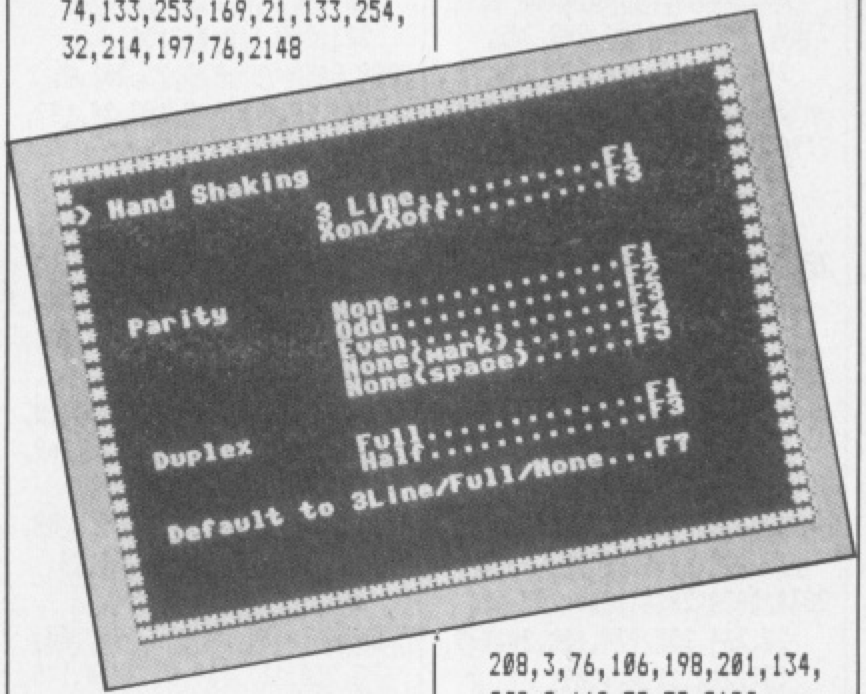
PROGRAM: COMMS GEN6

```
2000 FOR L=0 TO 80:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 49152+L*16+
   D,A:NEXT D
2010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2040+(L*10):STOP
2020 NEXT L
2040 DATA 133,253,132,254,32,
   204,255,160,0,177,253,200,
   201,0,240,6,2500
2050 DATA 32,210,255,76,9,
   192,96,238,33,208,32,204,
   255,32,86,192,2150
2060 DATA 162,0,189,0,4,157,
   0,8,189,0,5,157,0,9,189,0,
   1069
2070 DATA 6,157,0,10,189,0,7,
   157,0,11,232,224,0,208,
   227,206,1634
2080 DATA 33,208,96,32,86,
   192,169,38,141,24,208,32,
   228,255,240,251,2233
2090 DATA 169,23,141,24,208,
   96,162,0,169,1,157,0,216,
   157,0,217,1740
2100 DATA 157,0,218,157,0,
   219,232,224,0,208,237,96,
   162,0,189,0,2099
2110 DATA 4,157,0,16,189,0,5,
   157,0,17,189,0,6,157,0,18,
   915
2120 DATA 189,0,7,157,0,19,
   232,224,0,208,227,96,32,
   204,255,174,2024
2130 DATA 197,20,160,0,169,1,
   32,186,255,173,197,20,201,
   1,240,66,1918
2140 DATA 169,64,141,20,2,
   169,48,141,21,2,169,58,
   141,22,2,160,1329
2150 DATA 0,185,0,2,153,23,2,
   200,204,194,20,208,244,
   169,44,153,1801
2160 DATA 23,2,169,80,153,24,
   2,173,189,20,201,83,208,
   12,169,44,1552
2170 DATA 153,25,2,169,87,
   153,26,2,200,200,200,200,
   200,200,200,76,2093
2180 DATA 240,192,160,0,185,
   0,2,153,20,2,200,204,194,
   20,208,244,2024
2190 DATA 152,162,20,160,2,
   32,189,255,96,32,204,255,
   173,197,20,201,2150
2200 DATA 8,240,11,169,38,
   160,20,32,0,192,32,105,
   193,96,169,0,1465
2210 DATA 32,189,255,169,15,
   162,8,160,15,32,186,255,
   32,192,255,162,2119
2220 DATA 15,32,198,255,160,
   0,32,207,255,201,13,240,7,
   153,0,2,1770
2230 DATA 200,76,38,193,169,
   0,153,0,2,32,204,255,169,
   13,32,210,1746
2240 DATA 255,32,210,255,32,
   210,255,169,32,32,210,255,
   169,0,160,2,2278
2250 DATA 32,0,192,162,15,32,
   201,255,169,73,32,210,255,
   169,13,32,1842
2260 DATA 210,255,32,204,255,
   32,105,193,96,169,152,160,
   20,32,0,192,2107
2270 DATA 32,228,255,240,251,
   201,32,208,247,96,173,197,
   20,201,8,240,2629
2280 DATA 6,169,147,32,210,
   255,96,169,97,160,20,32,0,
   192,32,228,1845
2290 DATA 255,240,251,201,89,
   240,7,201,78,240,230,76,
   142,193,169,147,2759
2300 DATA 32,210,255,32,253,
   193,32,204,255,162,1,32,
   198,255,32,207,2353
2310 DATA 255,32,207,255,160,
   29,234,32,207,255,32,210,
   255,136,208,246,2753
2320 DATA 169,13,32,210,255,
   32,207,255,201,13,240,40,
   201,34,208,245,2355
2330 DATA 32,207,255,201,191,
   208,21,32,207,255,201,34,
   240,6,32,210,2332
2340 DATA 255,76,215,193,169,
   13,32,210,255,76,197,193,
   32,207,255,208,2586
2350 DATA 251,76,197,193,169,
   1,32,195,255,32,204,255,
   96,32,204,255,2447
2360 DATA 169,1,133,184,169,
   8,133,186,169,0,133,185,
   169,2,133,183,1957
2370 DATA 169,216,133,187,
   169,20,133,188,32,192,255,
   96,169,13,141,198,2311
2380 DATA 20,32,34,195,172,
   194,20,200,200,200,140,
   195,20,162,0,189,1973
2390 DATA 0,2,157,66,20,232,
   224,13,208,245,162,0,189,
   0,2,157,1677
2400 DATA 83,20,232,224,13,
   208,245,169,48,141,64,20,
   141,65,20,141,1834
2410 DATA 81,20,141,82,20,96,
   169,76,141,189,20,169,166,
   141,212,193,1916
2420 DATA 32,122,193,169,13,
   141,198,20,169,1,141,166,
   195,169,166,141,2036
2430 DATA 0,2,32,44,195,144,
   3,76,139,194,32,140,192,
   169,0,162,1524
2440 DATA 0,160,8,32,213,255,
   144,3,32,249,192,169,119,
   160,20,32,1788
2450 DATA 0,192,32,228,255,
   240,251,201,83,240,11,201,
   80,240,46,201,2501
2460 DATA 95,240,48,76,139,
   194,169,38,141,24,208,32,
   86,192,169,10,1861
2470 DATA 141,190,20,162,255,
   160,255,136,208,253,202,
   208,248,206,190,20,2854
2480 DATA 173,190,20,208,238,
   169,23,141,24,208,76,146,
   194,32,35,201,2078
2490 DATA 76,139,194,96,174,
   65,20,232,224,58,208,11,
   169,48,141,65,1920
2500 DATA 20,238,64,20,76,
   234,194,142,65,20,173,195,
   20,141,194,20,1816
2510 DATA 162,0,189,63,20,
   157,0,2,232,236,194,20,
   208,244,169,83,1979
2520 DATA 141,189,20,32,140,
   192,169,0,133,251,169,16,
   133,252,162,255,2254
2530 DATA 160,19,169,251,32,
   216,255,144,3,32,249,192,
   240,3,32,249,2246
2540 DATA 192,96,169,0,160,
   20,32,0,192,76,51,195,169,
   19,160,20,1551
2550 DATA 32,0,192,162,0,169,
   46,32,210,255,232,236,198,
   20,208,247,2239
2560 DATA 162,0,169,157,32,
   210,255,232,236,198,20,
   208,247,160,0,140,2426
2570 DATA 192,20,169,164,32,
   210,255,169,157,32,210,
   255,32,228,255,240,2620
2580 DATA 251,172,192,20,141,
   191,20,169,46,32,210,255,
   169,157,32,210,2267
2590 DATA 255,173,191,20,201,
   13,240,59,201,95,208,10,
   169,0,141,166,2142
2600 DATA 195,141,194,20,56,
   96,201,20,208,13,192,0,
   240,193,136,169,2074
2610 DATA 157,32,210,255,76,
   79,195,41,127,201,32,144,
   178,204,198,20,2149
2620 DATA 240,173,173,191,20,
   153,0,2,32,210,255,169,0,
   133,212,200,2163
2630 DATA 76,79,195,173,166,
   195,240,7,200,206,166,195,
   76,179,195,140,2488
2640 DATA 194,20,169,13,32,
   210,255,96,32,204,255,32,
   86,192,169,182,2141
2650 DATA 141,24,208,32,228,
   255,240,251,201,133,208,3,
   76,23,196,201,2420
2660 DATA 137,208,3,76,64,
   196,201,134,208,3,76,167,
   196,201,138,208,2216
2670 DATA 3,76,188,196,201,
   135,208,3,76,209,196,201,
   139,208,3,76,2118
2680 DATA 234,196,201,136,
   208,3,76,20,196,201,140,
   208,3,76,19,196,2113
2690 DATA 76,211,195,96,76,
   211,195,173,219,20,240,18,
   169,0,141,219,2259
2700 DATA 20,169,180,141,6,
   45,169,54,141,8,45,76,211,
   195,169,1,1630
2710 DATA 141,219,20,169,52,
   141,6,45,169,182,141,8,45,
   76,211,195,1820
2720 DATA 173,197,20,201,8,
   240,48,169,8,141,197,20,
   169,196,141,74,2002
2730 DATA 45,169,137,141,75,
```

```
    45,169,147,141,76,45,169,
    139,141,77,45,1761
2740 DATA 169,84,141,82,45,
    169,1,141,83,45,169,16,
    141,84,45,169,1584
2750 DATA 5,141,85,45,76,211,
    195,169,1,141,197,20,169,
    68,141,74,1738
2760 DATA 45,169,9,141,75,45,
    169,19,141,76,45,169,11,
    141,77,45,1377
2770 DATA 169,212,141,82,45,
    169,129,141,83,45,169,144,
    141,84,45,169,1968
2780 DATA 133,141,85,45,76,
    211,195,173,33,208,201,16,
    240,6,238,33,2034
2790 DATA 208,76,211,195,169,
    0,141,33,208,76,211,195,
    173,32,208,201,2337
2800 DATA 16,240,6,238,32,
    208,76,211,195,169,0,141,
    32,208,76,211,2059
2810 DATA 195,238,134,2,173,
    134,2,201,16,208,5,169,0,
    141,134,2,1754
2820 DATA 141,89,192,76,200,
    195,234,76,211,195,173,
    218,20,240,31,169,2460
2830 DATA 0,141,218,20,169,
    79,141,143,46,169,14,141,
    144,46,169,207,1847
2840 DATA 141,255,255,255,
    255,255,255,255,255,255,
    255,255,255,255,255,255,
    3966
4000 PRINT"[CLEAR]NEW"
    :PRINT"[DOWN2]
    LOAD"+CHR$(34)+"COMMS GEN
    7"+CHR$(34)+",8"
4005 REM ** CHANGE ,
    8 IN ABOVE LINE TO ,1 IF
    YOU ARE USING TAPE **
4010 PRINT"[DOWN4]RUN"
4020 POKE 631,13:POKE 632,13
    :POKE 633,13:POKE 198,3
    :PRINT"[HOME]"
```

PROGRAM: COMMS GEN7

```
2000 FOR L=0 TO 176:CX=0
    :FOR D=0 TO 15:READ A
    :CX=CX+A:POKE 50432+L*16+
    D,A:NEXT D
2010 READ A:IF A<>CX THEN PR
    INT"ERROR IN LINE";
    2040+(L*10):STOP
2020 NEXT L
2040 DATA 141,146,46,169,134,
    141,147,46,141,148,46,76,
    211,195,169,1,1957
2050 DATA 141,218,20,169,207,
    141,143,46,169,142,141,
    144,46,169,79,141,2116
2060 DATA 146,46,169,6,141,
    147,46,141,148,46,76,211,
    195,148,46,76,1788
2070 DATA 211,195,0,173,147,
    2,41,15,170,189,220,20,
    133,253,189,229,2187
2080 DATA 20,133,254,32,214,
    197,173,147,2,41,112,74,
    74,74,74,170,1791
2090 DATA 189,96,207,133,253,
    189,112,207,133,254,32,
    214,197,173,147,2,2538
2100 DATA 41,128,240,14,169,
    74,133,253,169,21,133,254,
    32,214,197,76,2148
```




```
2110 DATA 125,197,169,72,133,
    253,169,21,133,254,32,214,
    197,173,148,2,2292
2120 DATA 41,1,240,14,169,8,
    133,253,169,21,133,254,32,
    214,197,76,1955
2130 DATA 157,197,169,19,133,
    253,169,21,133,254,32,214,
    197,173,148,2,2271
2140 DATA 41,16,208,14,169,
    33,133,253,169,21,133,254,
    32,214,197,76,1963
2150 DATA 189,197,169,27,133,
    253,169,21,133,254,32,214,
    197,173,148,2,2311
2160 DATA 41,224,74,74,74,74,
    74,170,189,248,20,133,253,
    189,0,21,1858
2170 DATA 133,254,32,214,197,
    96,160,0,177,253,200,201,
    0,240,6,32,2195
2180 DATA 210,255,76,216,197,
    96,253,32,210,255,200,204,
    133,21,144,245,2747
2190 DATA 96,169,135,141,24,
    208,32,86,192,169,0,141,
    135,21,141,136,1826
2200 DATA 21,169,62,141,81,
    32,32,228,255,240,251,201,
    136,208,3,76,2136
2210 DATA 73,199,201,133,208,
    8,169,6,32,57,199,76,51,
    198,201,134,1945
2220 DATA 208,8,169,7,32,57,
    199,76,51,198,201,135,208,
    216,169,8,1942
2230 DATA 32,57,199,169,32,
    141,81,32,169,62,141,65,
    33,32,228,255,1728
2240 DATA 240,241,201,133,
    208,3,76,106,198,201,134,
    208,8,169,32,32,2190
2250 DATA 57,199,76,106,198,
    201,135,208,8,169,64,32,
    57,199,76,106,1891
2260 DATA 198,201,136,208,
    206,169,96,32,57,199,169,
    32,141,65,33,169,2111
2270 DATA 62,141,49,34,32,
    228,255,240,241,201,133,
    208,3,76,137,198,2238
2280 DATA 201,134,208,230,
    169,128,32,57,199,169,32,
    141,49,34,169,62,2014
2290 DATA 141,81,36,169,151,
    141,24,208,169,62,141,81,
    36,32,228,255,1955
2300 DATA 201,136,208,3,76,
    81,199,201,133,208,3,76,
    220,198,201,134,2278
2310 DATA 208,235,169,1,32,
    65,199,76,220,198,169,32,
    141,65,37,169,2016
2320 DATA 62,141,89,38,32,
    228,255,240,241,201,133,
    208,3,76,34,199,2180
2330 DATA 201,134,208,230,
    169,16,32,65,199,76,34,
    199,169,32,141,81,1986
2340 DATA 36,169,62,141,65,
    37,32,228,255,240,241,201,
    133,208,3,76,2127
2350 DATA 31,199,201,137,208,
    8,169,32,32,65,199,76,31,
    199,201,134,1922
2360 DATA 208,8,169,96,32,65,
    199,76,31,199,201,138,208,
    8,169,160,1967
2370 DATA 32,65,199,76,31,
    199,201,135,208,194,169,
    224,32,65,199,76,2105
2380 DATA 186,198,169,23,141,
    24,208,169,32,141,89,38,
    173,135,21,141,1888
2390 DATA 147,2,173,136,21,
    141,148,2,96,24,109,135,
    21,141,135,21,1452
2400 DATA 96,24,109,136,21,
    141,136,21,96,169,6,141,
    135,21,76,147,1475
2410 DATA 198,169,0,141,136,
    21,76,34,199,173,197,20,
    201,1,240,5,1811
2420 DATA 169,168,141,212,
    193,32,122,193,169,76,141,
    189,20,169,15,141,2150
2430 DATA 198,20,169,1,141,
    166,195,169,168,141,0,2,
    32,44,195,144,1785
2440 DATA 1,96,32,140,192,
    169,0,162,139,160,23,32,
    213,255,144,3,1761
2450 DATA 32,249,192,173,172,
    23,141,147,2,173,173,23,
    141,148,2,169,1960
2460 DATA 101,160,23,32,0,
    192,169,139,160,23,32,0,
    192,169,13,32,1437
2470 DATA 210,255,32,210,255,
    32,210,255,169,34,160,23,
    32,0,192,169,2238
2480 DATA 156,160,23,32,0,
    192,169,13,32,210,255,32,
    210,255,32,210,1981
2490 DATA 255,169,16,160,23,
    32,0,192,32,51,197,169,13,
    32,210,255,1806
2500 DATA 32,210,255,32,210,
    255,169,213,160,23,32,0,
    192,169,175,160,2287
2510 DATA 23,32,0,192,169,13,
    32,210,255,32,210,255,96,
    162,0,169,1850
2520 DATA 0,157,139,23,232,
    224,14,208,248,162,0,169,
```

```
0,157,156,23,1912
2530 DATA 232,224,14,208,248,
  162,0,169,0,157,172,23,
  232,162,0,169,2172
2540 DATA 0,157,175,23,232,
  224,36,208,248,169,101,
  160,23,32,0,192,1980
2550 DATA 169,15,141,198,20,
  32,51,195,140,119,23,144,
  1,96,162,0,1506
2560 DATA 189,0,2,157,139,23,
  232,236,194,20,208,244,
  169,13,32,210,2068
2570 DATA 255,169,25,160,23,
  32,0,192,169,15,141,198,
  20,32,51,195,1677
2580 DATA 192,0,240,14,162,0,
  189,0,2,157,156,23,232,
  236,194,20,1817
2590 DATA 208,244,32,241,197,
  173,147,2,141,172,23,173,
  148,2,141,173,2217
2600 DATA 23,169,13,32,210,
  255,32,210,255,169,120,
  160,23,32,0,192,1895
2610 DATA 32,51,197,169,13,
  32,210,255,169,45,160,23,
  32,0,192,169,1749
2620 DATA 36,141,198,20,32,
  51,195,192,0,240,14,162,0,
  189,0,2,1472
2630 DATA 157,175,23,232,236,
  194,20,208,244,169,17,32,
  210,255,32,210,2414
2640 DATA 255,169,74,160,23,
  32,0,192,32,228,255,240,
  251,201,78,208,2398
2650 DATA 3,76,253,199,201,
  89,208,240,169,147,32,210,
  255,169,83,141,2475
2660 DATA 189,20,169,168,141,
  0,2,172,119,23,192,0,240,
  14,162,0,1611
2670 DATA 189,139,23,157,1,2,
  232,236,119,23,208,244,
  172,119,23,200,2087
2680 DATA 140,194,20,32,140,
  192,169,139,133,251,169,
  23,133,252,162,212,2361
2690 DATA 160,23,169,251,32,
  216,255,144,3,32,249,192,
  240,3,32,249,2250
2700 DATA 192,96,0,32,48,207,
  234,234,234,234,32,186,
  255,169,0,32,2185
2710 DATA 189,255,32,192,255,
  169,0,133,251,169,8,133,
  252,160,0,177,2375
2720 DATA 251,170,189,231,23,
  141,191,20,140,192,20,162,
  4,32,201,255,2222
2730 DATA 173,191,20,32,210,
  255,32,204,255,172,192,20,
  200,192,40,208,2396
2740 DATA 222,162,4,32,201,
  255,169,13,32,210,255,32,
  204,255,32,155,2233
2750 DATA 201,165,251,24,105,
  40,133,251,165,252,105,0,
  133,252,201,11,2289
2760 DATA 208,187,165,251,
  201,232,208,181,162,4,32,
  201,255,169,13,32,2501
2770 DATA 210,255,32,204,255,
  169,4,32,195,255,96,162,
  255,160,255,136,2675
2780 DATA 208,253,202,208,
  248,96,162,200,202,208,
  253,96,0,173,32,208,2749
2790 DATA 141,69,24,169,0,
  141,66,24,169,15,141,24,
  212,169,48,133,1545
2800 DATA 107,169,0,133,106,
  169,1,141,68,24,169,2,162,
  2,160,255,1668
2810 DATA 32,186,255 169,1,
  162,147,160,2,32,189,255,
  32,192,255,162,2231
2820 DATA 2,32,198,255,32,
  228,255,201,0,208,3,76,9,
  203,141,191,2034
2830 DATA 20,41,128,208,68,
  32,204,255,174,191,20,189,
  137,21,201,0,1889
2840 DATA 208,3,76,194,202,
  189,137,21,141,67,24,201,
  34,208,2,169,1876
2850 DATA 39,32,210,255,173,
  66,24,240,32,173,68,24,
  240,24,160,0,1760
2860 DATA 173,67,24,145,106,
  230,106,208,16,230,107,
  165,107,201,159,208,2252
2870 DATA 8,169,0,141,68,24,
  238,32,208,32,204,255,32,
  228,255,201,2095
2880 DATA 0,240,156,141,191,
  20,170,189,11,22,201,0,
  240,17,141,191,1930
2890 DATA 20,162,2,32,201,
  255,173,191,20,32,210,255,
  76,223,201,173,2226
2900 DATA 191,20,201,133,208,
  6,32,23,192,76,223,201,
  201,137,208,6,2058
2910 DATA 32,67,192,76,223,
  201,201,134,208,11,169,1,
  141,66,24,32,1778
2920 DATA 123,203,76,223,201,
  201,138,208,14,169,0,141,
  66,24,173,69,2029
2930 DATA 24,141,32,208,76,
  223,201,201,135,208,6,32,
  69,203,76,223,2058
2940 DATA 201,201,139,208,6,
  32,190,204,76,223,201,201,
  136,208,9,32,2267
2950 DATA 108,192,32,212,194,
  76,223,201,201,140,208,3,
  76,35,203,76,2180
2960 DATA 223,201,173,191,20,
  201,7,240,10,201,5,240,17,
  76,223,201,2229
2970 DATA 238,32,208,173,218,
  20,240,3,32,123,203,76,
  223,201,160,0,2150
2980 DATA 185,175,23,201,0,
  240,28,170,140,192,20,189,
  11,22,141,191,1928
2990 DATA 20,162,2,32,201,
  255,173,191,20,32,210,255,
  172,192,20,200,2137
3000 DATA 76,224,202,32,204,
  255,76,223,201,32,204,255,
  169,95,32,210,2490
3010 DATA 255,169,157,32,210,
  255,169,32,32,210,255,169,
  157,32,210,255,2599
3020 DATA 76,57,202,169,2,32,
  195,255,169,0,141,66,24,
  169,1,141,1699
3030 DATA 68,24,230,106,208,
  2,230,107,169,0,160,0,145,
  106,173,69,1797
3040 DATA 24,141,32,208,96,
  169,0,133,251,169,12,133,
  252,160,0,177,1957
3050 DATA 251,240,37,170,189,
  11,22,141,191,20,162,2,32,
  201,255,173,2097
3060 DATA 191,20,32,210,255,
  32,204,255,165,251,24,105,
  1,133,251,165,2294
3070 DATA 252,105,0,133,252,
  76,79,203,76,223,201,169,
  50,141,1,212,2173
3080 DATA 169,25,141,5,212,
  169,32,141,4,212,169,33,
  141,4,212,96,1765
3090 DATA 141,4,212,96,255,
  255,254,255,255,255,255,
  255,255,255,255,255,3512
3100 DATA 0,0,0,8,1,0,0,0,0,
  0,4,0,0,0,0,0,13
3110 DATA 0,0,0,0,0,0,0,0,0,
  0,0,0,1,0,0,0,1
3120 DATA 255,254,255,255,
  255,255,255,255,255,255,
  255,255,254,255,255,239,
  4062
3130 DATA 254,255,255,255,
  255,255,255,255,255,255,
  255,255,255,255,255,255,
  4079
3140 DATA 0,0,0,0,0,0,0,8,0,
  8,0,2,1,0,0,0,19
3150 DATA 0,32,0,0,0,0,0,0,0,
  0,0,64,0,0,0,0,96
3160 DATA 169,14,32,210,255,
  169,8,32,210,255,169,5,32,
  210,255,169,2194
3170 DATA 6,141,147,2,32,204,
  255,32,86,192,169,166,141,
  24,208,32,1837
3180 DATA 228,255,240,251,
  201,133,208,6,32,241,197,
  76,20,204,201,137,2630
3190 DATA 208,3,76,109,204,
  201,134,208,11,169,23,141,
  24,208,32,81,1832
3200 DATA 206,76,20,204,201,
  138,208,3,76,179,204,201,
  135,208,3,76,2138
3210 DATA 137,204,201,139,
  208,3,76,148,204,201,136,
  208,3,76,162,204,2310
3220 DATA 201,140,208,3,76,
  173,204,76,31,204,76,20,
  204,169,23,141,1949
3230 DATA 24,208,169,147,32,
  210,255,32,28,194,32,159,
  199,32,173,201,2095
3240 DATA 76,20,204,76,20,
  204,76,20,204,169,23,141,
  24,208,32,253,1750
3250 DATA 199,76,20,204,169,
  23,141,24,208,32,89,199,
  32,105,193,76,1790
3260 DATA 20,204,169,23,141,
  24,208,32,60,205,76,20,
  204,32,200,195,1813
3270 DATA 76,20,204,169,23,
  141,24,208,32,86,194,76,
  20,204,165,106,1748
3280 DATA 201,0,208,7,165,
  107,201,48,208,1,96,162,3,
  230,106,208,1951
3290 DATA 2,230,107,169,0,
  160,0,145,106,202,208,241,
  174,82,20,232,2078
3300 DATA 224,58,208,11,169,
  48,141,82,20,238,81,20,76,
  242,204,142,1964
3310 DATA 82,20,173,195,20,
  141,194,20,162,0,189,80,
  20,157,0,2,1455
```

Telephone EXCHANGE

```
3320 DATA 232,236,194,20,208,244,169,83,141,189,20,32,140,192,169,0,2269
3330 DATA 133,251,169,48,133,252,166,106,164,107,169,251,32,216,255,144,2596
3340 DATA 3,32,249,192,240,3,32,249,192,169,0,133,106,169,48,133,1950
3350 DATA 107,169,0,141,66,24,169,1,141,68,24,96,169,76,141,189,1581
3360 DATA 20,169,191,141,212,193,32,122,193,169,13,141,198,20,169,1,1984
3370 DATA 141,166,195,169,191,141,0,2,32,44,195,144,3,76,113,205,1817
3380 DATA 32,140,192,169,0,162,0,160,48,32,213,255,144,3,32,249,1831
3390 DATA 192,169,119,160,20,32,0,192,32,228,255,240,251,201,83,240,2414
3400 DATA 14,201,80,240,101,201,95,208,3,76,69,206,76,113,205,169,2057
3410 DATA 147,32,210,255,169,0,133,106,169,48,133,107,173,0,48,240,1970
3420 DATA 26,160,0,177,106,201,0,240,52,32,210,255,32,70,206,32,1799
3430 DATA 198,205,230,106,208,235,230,107,76,161,205,169,33,160,207,32,2562
3440 DATA 0,192,32,105,193,96,32,228,255,208,1,96,201,32,240,5,1916
3450 DATA 201,95,240,17,96,32,228,255,201,32,208,249,96,32,228,255,2465
3460 DATA 240,251,76,113,205,104,104,76,113,205,169,4,174,219,20,224,2297
3470 DATA 0,240,7,162,6,160,0,76,254,205,162,4,160,7,32,186,1661
3480 DATA 255,169,0,32,189,255,32,192,255,169,0,133,106,169,48,133,2137
3490 DATA 107,160,0,177,106,201,0,240,23,141,191,20,162,4,32,201,1765
3500 DATA 255,173,191,20,32,210,255,230,106,208,230,230,107,76,17,206,2546
3510 DATA 162,4,32,201,255,169,13,32,210,255,32,204,255,162,4,32,2022
3520 DATA 195,255,76,113,205,96,160,20,162,255,202,208,253,136,208,248,2792
3530 DATA 96,162,0,169,0,157,0,12,157,0,13,157,0,14,157,0,1094
3540 DATA 15,232,208,241,169,12,133,254,169,0,133,253,169,147,32,210,2377
3550 DATA 255,32,228,255,208,6,32,230,206,76,113,206,76,241,206,201,2571
3560 DATA 20,240,42,201,95,240,88,201,13,240,70,201,34,208,2,169,2064
3570 DATA 39,160,0,145,253,32,210,255,230,253,208,2,230,254,165,254,2690
3580 DATA 201,15,208,6,165,253,201,231,240,53,76,113,206,165,254,201,2588
3590 DATA 12,208,9,165,253,201,0,208,3,76,113,206,165,253,56,233,2161
3600 DATA 1,133,253,165,254,233,0,133,254,169,20,32,210,255,76,113,2301
3610 DATA 206,169,95,32,210,255,169,13,160,0,145,253,76,152,206,160,2301
3620 DATA 1,169,0,145,253,96,169,95,32,210,255,169,157,32,210,255,2248
3630 DATA 96,141,191,20,201,20,240,21,201,13,240,17,201,32,176,3,1813
3640 DATA 76,113,206,173,191,20,201,96,144,3,76,16,207,76,127,206,1931
3650 DATA 173,191,20,201,193,176,3,76,113,206,201,219,144,239,76,113,2344
3660 DATA 206,147,32,32,17,17,78,79,32,70,73,76,69,13,0,0,941
3670 DATA 169,4,174,219,20,224,0,240,5,162,6,160,0,96,162,4,1645
3680 DATA 160,7,96,255,255,255,255,255,255,255,255,255,254,255,255,239,3561
3690 DATA 254,255,255,255,255,255,255,255,255,255,255,255,255,255,255,255,4079
3700 DATA 60,120,63,120,66,120,69,0,0,0,0,0,0,0,0,0,618
3710 DATA 21,207,21,207,21,207,21,0,63,47,0,0,0,0,0,0,815
3720 DATA 147,32,32,17,17,78,79,32,70,73,76,69,13,0,110,111,956
3730 DATA 112,113,61,62,63,41,42,255,255,255,255,255,255,255,255,255,2789
3740 DATA 0,0,0,8,1,0,0,0,0,4,0,0,0,0,0,0,13
3750 DATA 0,0,0,0,0,0,0,0,0,0,0,0,1,0,0,0,1
3760 DATA 0,204,255,255,255,255,255,255,255,255,255,255,254,255,255,239,3757
3770 DATA 254,255,255,255,255,255,255,255,255,255,255,255,255,255,255,255,4079
3780 DATA 0,0,0,0,0,0,0,8,0,8,0,2,1,0,0,0,19
3790 DATA 0,32,0,0,0,0,0,0,0,0,0,100,0,10,0,40,182
3800 DATA 0,255,255,255,255,7,255,255,255,255,255,255,255,255,255,255,3577
4000 REM ** NOW SAVE PROG **
4030 POKE 43,0:POKE 44,192:POKE 45,1:POKE 46,208
4035 REM** CHANGE ,8 IN NEXT LINE TO ,1 IF YOU ARE USING TAPE **
4040 SAVE "2TELCOM/V1",8
```

FROGGY

Daryl Bowers adds birds and flies to the hazards which our little frog must face.

AS PROMISED, THIS MONTH'S exiting installment concerns the FLY and BIRD. These two routines are very similar and therefore it will suffice to explain just one in detail. As usual, the first step is to insert calls to the routines in the main loop at the start. Lines 1540 and 12550 do this.

The first two lines check whether the fly has started to move yet. If not (FLYMOVE = 0) a branch is made to GETFLY, which we will come to later. FLYXLO the fly's X position (low byte), is stored in $D00C (X position of sprite number six). The next nine lines check FLYXHI, the X position's high bit, and either set or reset bit six of $D010 (most significant bit of the sprite's X co-ordinate).

Stored at $D00D is 108, the fly's Y co-ordinate, which does not alter (our fly hasn't heard of wind currents yet!).

The fly has two frames of animation stored at sprite definitions 219 and 220. WINGFLY is a variable which alternates in value between zero and one. Depending on this value either 219 or 220 is stored in $07FE (sprite six definition pointer). Following this, WINGFLY is 'Exclusive Or'ed with one to reverse the value.

The next 15 lines are concerned with the fly's movements. FLYDEL, as its name suggests, is a delay counter. When it reaches zero, the fly's speed, FLYSPD, is restored into FLYDEL ready for the next time. Next the X co-ordinate is reduced by one. If it is equal to 255 then the fly has either just come on to the screen or gone off it. The high bit of the X co-ordinate is decreased and if the value is not negative then the fly is on the right side of the screen and nothing needs to be done. If, however, it is negative, then the fly has gone off the left side of the screen and so the high bit is increased up to one again, ready for its next appearance, and FLYMOVE is reset to zero.

```
1540          JSR FLY
1550          JSR BRD
8320          ;
8330          ;
8340 FLY
8350          ;
8360          ;
8370          LDA FLYMOVE
8380          BEQ GETFLY
8390 PRNTFLY  LDA FLYXLO
8400          STA $D00C
8410          LDA FLYXHI
8420          BEQ NEXTFLY
8430          LDA $D010
8440          ORA #64
8450          STA $D010
8460          JMP NXTFLY2
8470 NEXTFLY
8480          LDA $D010
8490          AND #255-64
8500          STA $D010
8510 NXTFLY2
8520          LDA #108
8530          STA $D00D
8540          LDA WINGFLY
8550          BEQ LOFLY
8560          LDA #219
8570          STA $07FE
8580          JMP MVFLY
8590 LOFLY
8600          LDA #220
8610          STA $07FE
8620 MVFLY
8630          LDA WINGFLY
8640          EOR #1
8650          STA WINGFLY
8660 NOCHW
8670          DEC FLYDEL
8680          BNE NOMVFLY
8690          LDA FLYSPD
8700          STA FLYDEL
8710          DEC FLYXLO
8720          LDA FLYXLO
8730          CMP #$FF
8740          BNE NOMVFLY
8750          DEC FLYXHI
8760          LDA FLYXHI
8770          BPL NOMVFLY
8780          INC FLYXHI
8790          INC FLYXHI
8800          LDA #0
8810          STA FLYMOVE
8820 NOMVFLY
8830          RTS
8840          ;
8850          ;
8860 GETFLY
8870          LDY FLYPOS
8880          DEC FLYDEL
8890          BNE NOTFLY
8900          INC FLYPOS
8910          LDA RANDTAB,Y
8920          BPL CHKFLY
8930          LDA #0
8940          STA FLYPOS
8950 CHKFLY
8960          CMP #1
8970          BNE NOTFLY
8980          ;
8990          LDA #1
9000          STA FLYMOVE
9010 NOTFLY   RTS
9020          ;
9030          ;
9040          ;
9050 BRD
9060          ;
9070          ;
```

The latest section is only called if the fly has not yet started to move. FLYPOS contains the position of the current value in the random number table RANDTAB, and if FLYDEL has reached zero then this value is checked to see if it is positive or negative. A negative number indicates that the end of the table has been reached, and that FLYPOS needs to be reset to zero, the start of the table. If the value is psoitive it is checked to see if it is zero or one. If the value is zero, then nothing happens, and we return to the main loop. If the value is one, however, we store a one in FLYMOVE to start the fly moving again.

There are few changes to the above routine involved in printing and moving the bird – BRD – such as different sprite definitions and speed of movement. By comparing the two it is easy to see how they differ.

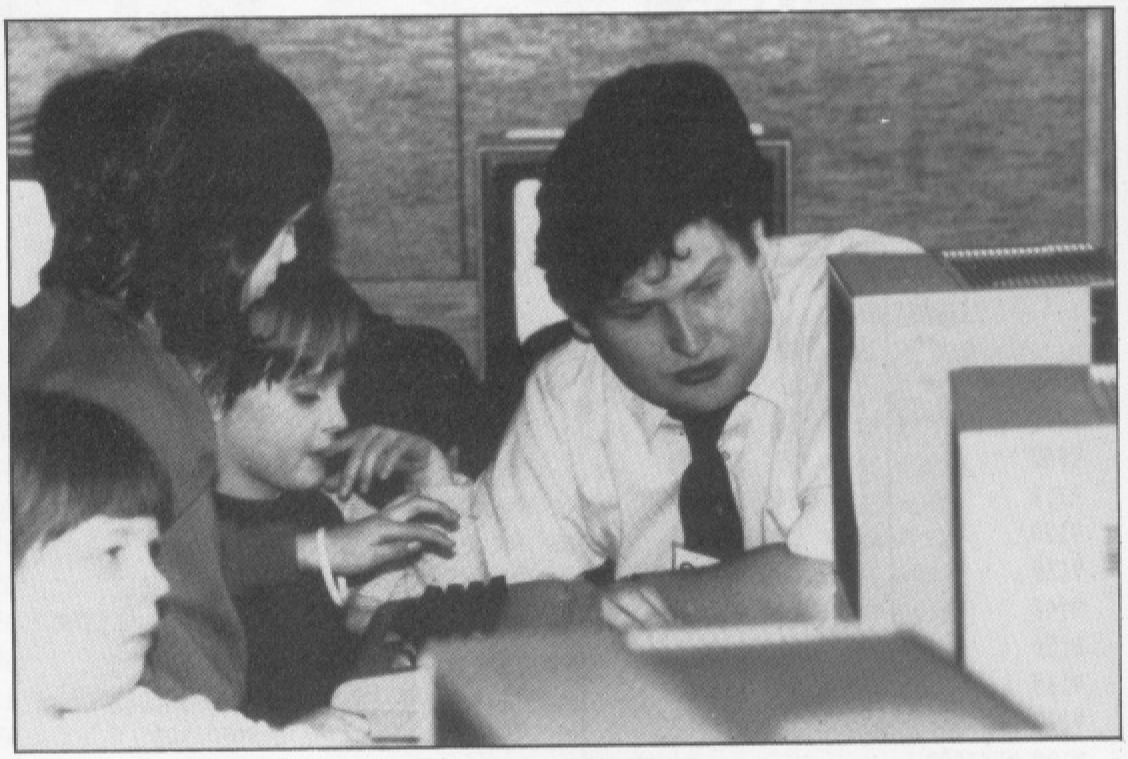
To execute the code, follow the same steps as outlined in the last issue. Next issue will provide a routine to update the status panel at the bottom of the screen.



```
9080            LDA BRDMOVE
9090            BEQ GETBRD
9100            LDA BRDXLO
9110            STA $D00E
9120            LDA BRDXHI
9130            BEQ NEXTBRD
9140            LDA $D010
9150            ORA #128
9160            STA $D010
9170            JMP NXTBRD2
9180 NEXTBRD
9190            LDA $D010
9200            AND #255-128
9210            STA $D010
9220 NXTBRD2
9230            LDA #108
9240            STA $D00F
9250            LDA WINGBRD
9260            BEQ LOBRD
9270            LDA #221
9280            STA $07FF
9290            JMP MVBRD
9300 LOBRD
9310            LDA #222
9320            STA $07FF
9330 MVBRD
9340            DEC BRDWDEL
9350            BNE NOCHWB
9360            LDA #255
9370            STA BRDWDEL
9380            LDA WINGBRD
9390            EOR #1
9400            STA WINGBRD
9410 NOCHWB
9420            DEC BRDDEL
9430            BNE NOMVBRD
9440            LDA BRDSPD
9450            STA BRDDEL
9460            DEC BRDXLO
9470            LDA BRDXLO
9480            CMP #$FF
9490            BNE NOMVBRD
9500            DEC BRDXHI
9510            LDA BRDXHI
9520            BPL NOMVBRD
9530            INC BRDXHI
9540            INC BRDXHI
9550            LDA #0
9560            STA BRDMOVE
9570 NOMVBRD
9580            RTS
9590            ;
9600            ;
9610 GETBRD
9620            ;
9630            LDY BRDPOS
9640            DEC BRDDEL
9650            BNE NOTBRD
9660            INC BRDPOS
9670            LDA RANDTAB,Y
9680            BPL CHKBRD
9690            LDA #0
9700            STA BRDPOS
9710 CHKBRD
9720            CMP #1
9730            BNE NOTBRD
9740            ;
9750            ;
9760            LDA #1
9770            STA BRDMOVE
9780 NOTBRD     RTS
9790            ;
9800 FINISH
9810            .END
```

We sent our roving reporter, Marie Curry, on a Commodore computer weekend. Here's her reaction.

BASIC TRAINING



AS ONE OF THOSE UNFORTUNATE people whose education was woefully lacking when it comes to the computer revolution, I reached the stage where I began to feel that I should not let the march of technology just stompt right over me. I then heard about computer weekends run by a company called Ardmore Adventure — better known for its involvement in children's activity camps. I signed up for a weekend at the Crest Hotel in High Wycombe and it was with no small amount of trepidation that I set off to attend on a freezing cold Friday in February.

The actual course begins on Saturday morning, but I decided to go on the Friday in order to get my bearings and to meet some of the people who have the mammoth task of organising the weekend breaks. All the equipment must be set up in advance and, of course, it has to be shipped in since Crest Hotels aren't normally provided with enough Commodore computers to keep 50 micro enthusiasts happy for 48 hours.

The aims of the course are simple. You should attend with the intention of doing exactly as you please as long as it's connected with computers. If you want to tackle advanced machine code programming then there'll be somebody there to help you. Alternatively, if you're completely computer illiterate, like me, then you can start on the absolute basics of Basic and work your way up.

The whole weekend package includes accommodation and meals but if you don't want to stay at the hotel and mix with your fellow victims outside of study hours then you can go somewhere else and pay only the tuition fee.

I decided to go for the all-singing, all-dancing, meals and microchips inclusive version — and I wasn't disappointed.

The Surroundings

I spent a very pleasant two days in the Crest Hotel in High Wycombe. The accommodation was clean and comfortable and the service was fast and efficient, executed with a lavish amount of goodwill. During a sub-zero February weekend (you remember those!) there wasn't so much as a hint of a draught.

The course was exceedingly hard work and after a whole days brain drain it was nice to know that there was a decent meal waiting and a good night's sleep.

Two sizeable rooms had been set aside to accommodate the huge amounts of electronic equipment which had been bought in to cope with the large numbers of 'students' who were attending that weekend. One room was allocated to the under 14s and the other was for the more mature students. By Saturday morning the jumble of wires, polystyrene cardboard and plastic which had infested the rooms on Friday evening had been transformed into a very spruce looking set-up with Commodore 64s and 128s adorning tables around the walls.

In the lobby outside there was a plentiful supply of tea, coffee, biscuits and orange squash for those who fell by the wayside and had to have a break for resuscitation. There was a morning break for coffee and an afternoon break for tea, just like those long ago playtimes at school. These were quite productive in themselves as everyone was able to get to know each other and compare notes.

The Mentors

You may possibly have heard of Ardmore Adventure before reading this article, since for some time the company has been involved in running children's adventure holidays.

The first computer weekend was held in April 1985 and more have been run at regular intervals since then. Ardmore had realised — through contact with parents — that many adults were uneasy with computers and suffered from that disease which is common among those of us who are no longer teenagers — technophobia. It must be very frustrating for parents with school age children to realise that there is one homework subject on which they can give absolutely no useful advice at all.

The weekend I attended was graced with six exceptionally gifted Ardmore staff who come from a variety of walks of life and dedicate their weekends to the alleviation of the sufferings of those who are less hi-tech than themselves.

Doug Gregory, who is a teacher by trade, oversees operations, and he is ably assisted by Eric Doyle — computer journalist, photographer and experienced programmer. Paul and Keith, both college students studying computer related subjects, take the junior class (commonly referred to by Ardmore staff as the advanced group!). Beginners, like myself, are assisted by Lee, who is also involved in education in his other life and John who claims to be an estate agent from Monday to Friday. As I said, a mixed bunch but a very well chosen and able group of advisors. The course was running at maximum the weekend I attended but no matter how few pupils sign up there will never be less than two staff.

As I mentioned earlier, when the course begins you are told that you can really do as you please. This is the only rule which must be adhered to at all times. With such a diverse mixture of staff available, there is always someone who can advise you on any subject under the Commodore sun. I began on Saturday morning as an absolute beginner and I like to think that by Sunday evening I was no longer exactly that.

The Enthusiasts

The weekends attract an incredible variety of people and the one which I attended was especially diverse since many of those present had actually won their weekend break in a Commodore

spot the ball competition (yes, people do actually win them!).

What I found most surprising was that there were people present who had never even touched a computer in their lives before — even I have a certain amount of hands-on experience.

These particular individuals were usually those who wanted to find out a bit about computers before actually investing their hard earned money in one. It seems to me an eminently sensible idea since if you don't know the difference between hardware and software and you've never even seen a disk drive then the task of choosing and purchasing a computer from the enormous variety at present available on the market is daunting at best and terrifying at worst.

At the other end of the spectrum were those who owned C64s, knew their way around the keyboard fairly well, had a grasp of Basic, possibly a smattering of machine code and had come to a sort of halt in their self-teaching programme. The weekend for these types, regarded by myself as the boffins of the group, provided the consolidation of their knowledge and the pointers they needed to set them leaping ahead once more.

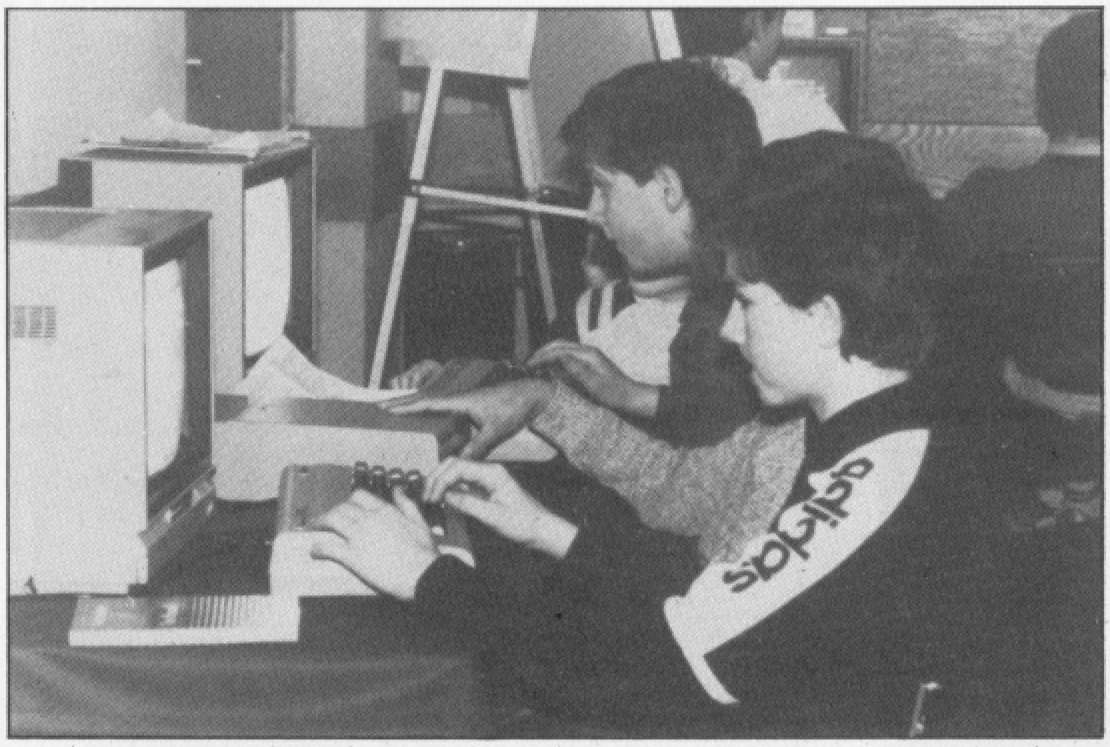
I have been involved in the computer industry for some time and the individuality of those I come into contact with has never ceased to amaze me. A policeman, a lady who runs an aquatic garden centre and an animal nutritionist were just three of the people who were thrown together for a weekend with nothing in common bar an interest in computers. If you were to deal with the weekend merely in human terms, it provided a chance to associate with some very interesting and intelligent people but of course there was much more to it than that. The most important part is still to come.

The Curriculum

The course has no strictly formal structure. Probably the best way to give you some sort of idea about what is available is if I detail how my teaching was arranged and what I was able to get out of it.

It would be impossible to have an inflexible curriculum since the organisers have no idea what sort of span of abilities they wil be dealing with, in terms of micro-knowledge, until everyone turns up on the first day.

The initial task for everyone is to declare themselves an absolute beginner or otherwise. I was the former and so I was treated to a well planned and instructive two hour tutorial on Basic. I was sharing a C64 with a brilliant fellow illiterate called Letty and together we managed to progress through our tutorial sheets in leaps and bounds.



These sheets were compiled by Doug Gregory and are concise and very well structured. They deal with Basic in simple steps giving practical exercises for illustration. Fundamentally, the sheets are designed to make you feel at home with the computer and also with very simple Basic. They also serve to enable you to become familiar with the 64 which is very important when so many people feel nervous when confronted with a computer keyboard.

After about 90 minutes my partner and I had managed to write and run a simple maths program for testing arithmetic. When we typed it in and it ran first time we felt like geniuses. The greatest asset of the course is that if you do get stuck then there is always someone within shouting distance who will be at your elbow in a few seconds to sort out your problems. This saves much poring over hot keyboards and much sweating over confused listings.

After a sumptuous lunch we returned for more intellectual stimulus and found that we were about to be introduced to Logo.

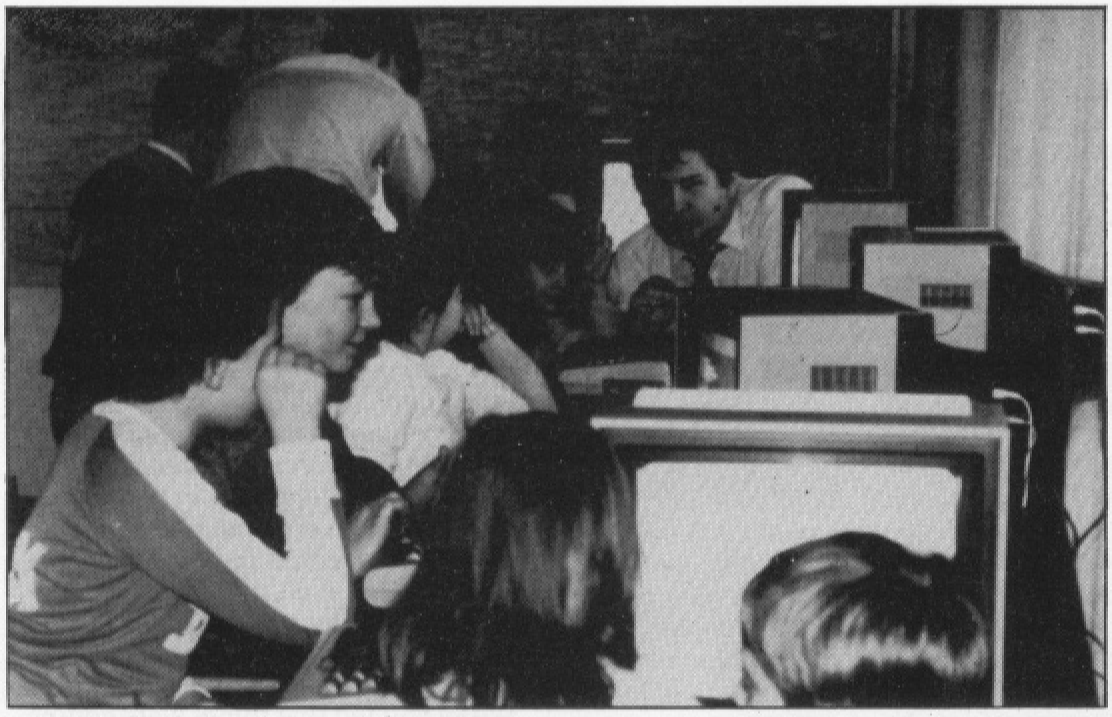
Logo is a language which is often used in schools to teach young children the type of logical thought which is necessary when working with computers. Logo is very simple to learn as a concept and I found that I was soon guiding my turtle around the screen and happily defining my own commands. I began to feel very self-confident about using it and for someone who has very little experience, it is a useful tool, although after about an hour I began to feel rightly or wrongly — that its uses are very limited. My fellow sufferers also seemed to be getting the hang of it fairly well, although whether this was due to the graphic human turtle demonstration with which the class kicked off will probably never be known!

When you felt that things were getting perhaps just a little bit tedious, one word would see you whisked away to something different but equally instructive. During the afternoon period my fellow students became re-involved in Basic, learnt the wonders of music programs on the 64 of just had a quick go at Impossible Mission for some not so light relief.

While I was becoming immersed in Basic and Logo, the two other groups were in session. The children's section of the course was held in a next door room and I presume that it was sound-proofed in some way as hardly a murmur was heard from that vicinity all weekend. Most of the under 14s had a vast amount more experience of computers than their adult counterparts and were perfectly at home with the electronic beasties. They too could come and go as they pleased to a certain extent although supervision was such that parents had no worries about the welfare of their offspring.

The advanced group, under the guidance of Eric Doyle, were learning more about machine code and having a look at some more complicated programs. Many of them bought their own programming problems with them and these were dealt with in due course so that they were able to go home at the end of the weekend with the necessary knowledge to continue their machine code masterpieces.

Sunday was not a day of rest. It was dedicated to the teaching — in the beginners group — of the use of Easy Script, Commodore's word processing package. This may sound a little odd, to devote a whole day to the use of a word processor, but I think there was a lot of sense behind this. Many of those present were looking into the possibility of buying a computer to help them with either their own small businesses or merely their domestic administration. Using a word processor shows you very quickly and simply what can be done with very little



knowledge and illustrates the power of the many software utilities packages which are available at the moment for the 64 and hopefully in the fairly near future for the C128.

By the time we finished for tea on Sunday evening I knew that I would be able to return to the office and impress everyone with my technical knowledge which had definitely increased one hundredfold since I left on Friday afternoon.

To be honest, it is very difficult to find any specific criticisms about the weekend. Perhaps a little too much time was devoted to Logo but then I could have stopped doing that and gone on to an alternative occupation if I had been really bored. I would have liked to improve my handling of Basic a little more but it was only lack of time that prevented me from doing so.

As a weekend with a difference, it's very enjoyable. And as a course in computing it's very instructive. If you have a couple of days to spare and you want to use them constructively, I thoroughly recommend a computer weekend. Mind you, I'd used my brain so much that I had a lot of difficulty getting back to the grind on Monday!

Touch Line

Ardmore Adventure holidays are run all year round at the Challenge Centre, Llanfyllin, Powys, Mid Wales. Special weekend courses can also be arranged for groups from schools or businesses. Courses already arranged around the country in 1986 are as follows:

High Wycombe	4-6 April, 18-20 April, 7-9 March, 21-23 March
Coventry	16-18 May
Portsmouth	23-25 May
High Wycombe	30 May-1 June
Cardiff	13-15 June
High Wycombe	27-29 June
Runcorn	12-14 September
High Wycombe	3-5 October

Prices

Computing course £30
Dinner, bed and breakfast £27.50 per night
Up to three children can be accommodated free when accompanied by two adults.

Save the Galaxy from the evil Alana in

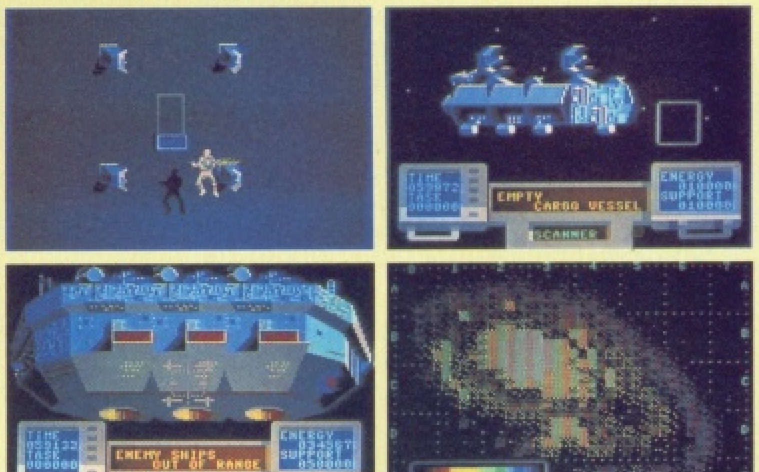
STARSHIP ANDROMEDA

A Strategic Action Adventure in Metaspace



SPECIAL FEATURES include:

- ★ 12 Arcade and Strategy games in **One** Program
- ★ 10,000 Metaspace locations
- ★ Superb sound and 3D graphics
- ★ A major battle of wits



STARSHIP ANDROMEDA The final frontier in space exploration

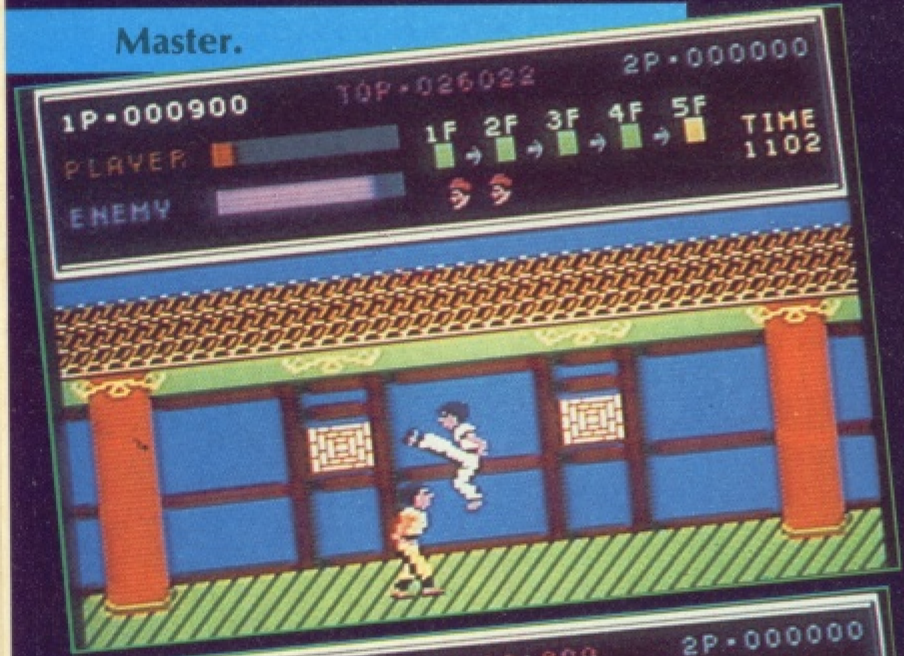
OUT NOW

Available from all good software retailers — if it's not there, please order it — or in case of difficulty send your crossed cheque/P.O. made out to **Ariolasoft U.K. Ltd.,** including your own name and address, to **Ariolasoft U.K. Ltd., 68 Long Acre, London WC2E 9JH.**
STARSHIP ANDROMEDA C64 disk **£12.95** — C64 Cassette **£9.95**
UK orders only. Prices include P&P. Please allow 28 days for delivery.

ariolasoft
HIGH PERFORMANCE PROGRAMS

GAME of the month

Gordon Hamlett has been kicking and punching his way through US Gold's Kung Fu Master.









YET ANOTHER PRINCESS IS IN NEED OF rescue. Using all your Kung Fu skills, you must battle your way through five floors of the wizard's temple in order to rescue her. As is only to be expected, the wizard has arranged a welcoming committee for you to try and ensure that you don't succeed in your quest.

Control of your character is simplicity itself. Leaving the joystick button alone, you can move left and right, jump and duck. Holding the fire button down puts you into an offensive mode and you can now aim kicks left and right as well as performing a jumping kick and a squatting kick. If you press the space bar this toggles the action between kicking and punching left and right, jumping and squatting punches.

Timing is the essence of successful squat. Judging your punch or kick correctly and your opponent will crumple instantly, to the accompanying sound of a very realistic "thwack". But one of the nice things about this game is that you can get away with mistiming a few blows. If that happens, an opponent will attempt to grapple with you. You can break his grasp by waggling your joystick furiously. There is of course a price to be paid for your error of timing. This is in the form of loss of energy. In the top left hand corner of the screen are two bars representing energy levels for you and your adversary. Should your energy drop to zero, you lose one of the three lives.

Each level must be completed within a certain time limit. A clock starts off at two thousand and quickly counts down towards zero. Failure to reach the stairs at the end of the time limit again results in the loss of a life. If you do reach the stairs in time, you receive a bonus based on the amount of time you had left and the amount of energy. Score 40,000 points and you gain an extra life. If you lose a life, you must start that particular level from scratch again but your clock and energy bar are restored to full values.

Most of your opponents on the first level are henchmen who can be easily despatched with a single kick or punch. Occasionally, you will come across a man throwing knives at you. These you must duck under or jump over and then move in close to dispose of your enemy, who requires two blows to defeat him. At the end of each level is a guardian. He may be armed or simply vicious but one thing you can be sure of is that he is tough to beat and it requires several blows before you can get his energy level down to zero. If you have killed all the baddies on a particular level and then beaten the guardian, you can reach the stairs and so gain access to the next level. Starting a new level gives you a chance to get your breath back as well as resetting your clock and energy bar.

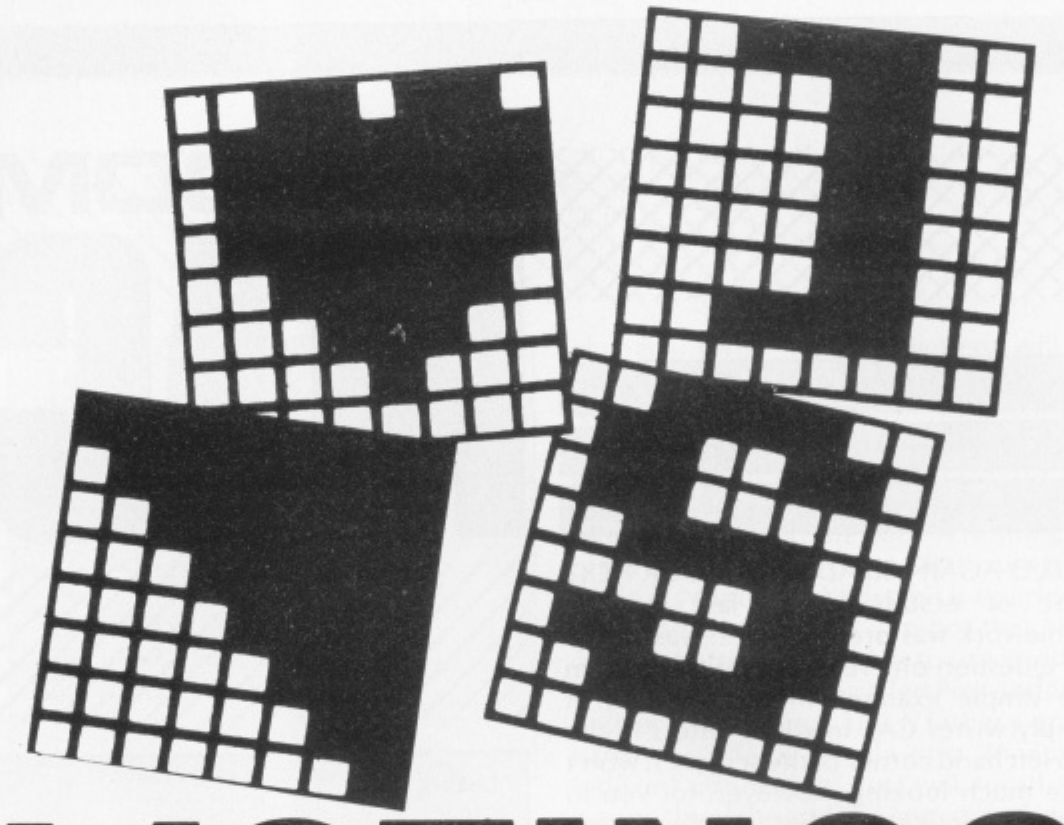
Points are only awarded if you dispose of your opponent cleanly i.e. you don't have to wrestle to get him off. How much you score depends on how many blows it takes to kill them and what move you used. Punches and flying kicks score more than ordinary kicks.

Your opponents on the second level are of a totally different nature. Falling balls and vases contain snakes and dragons and mystic globes explode around you. Falling objects can be destroyed with jumping kicks or you may prefer to run out of the way of the dragon's fiery breath. Snakes can't be killed but must be jumped over. Dwarves also appear who, given the chance, like to somersault on to your back and sap your energy.

The next levels introduce the only other kind of nasty to be met in the game – killer bees. These can be killed with a single kick or punch. The baddies start to appear in combinations now and you will need very fast reactions if you are to succeed.

Kung-Fu Master is an addictive, enjoyable game to play. A lot of this is due to the fact that it's easy to get into and I can see it as the sort of game people will load in for a quick half hour of mindless violence. The graphics are colourful although quite chunky. All this to the accompaniment of a relentless tune and good sound effects.

Listings will be much easier to enter with our new system.



LISTINGS

COMMODORE LISTINGS ARE RATHER well known for the horrible little black blobs that always abound. Unfortunately the graphics characters which are used to represent graphic and control characters do not reproduce very well and they are also difficult to find on the Commodore keyboard.

In future all control and graphics commands will be replaced by a mnemonic within square brackets. This mnemonic is not typed out as printed in the magazine but rather the corresponding key or keys on the keyboard are pressed. For example [RIGHT] means press the cursor right key, you do not type in [RIGHT]. All of the keywords, what keys to press and how they are shown on the screen are shown below.

Any character that is accessed by pressing shift and a letter will be printed as [Sletter].

[SA] shift and A
[S+] shift and +

Any character that is accessed by pressing the Commodore key and a letter will be printed as [Cletter]

[CA] Commodore and A
[C+] Commodore and +
[C1] Commodore and 1

If any characters are repeated the mnemonic will be followed by a number. This number is how many times you should enter the character. Any number of spaces over one will also be represented in this form

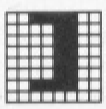
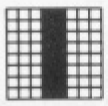
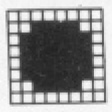
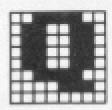
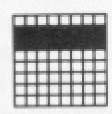
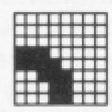
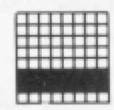
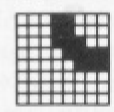
[RIGHT10] press cursor right 10 times
[C+10] press Commodore and + 10 times
[SPC10] Press the space bar 10 times

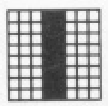
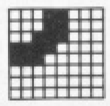
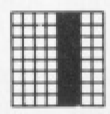
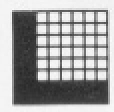
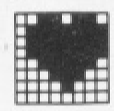
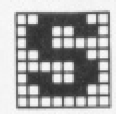
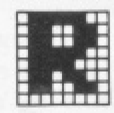
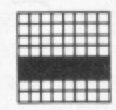
Any other characters should be easily recognisable for example CTRL-N means press CTRL and N and LEFT-ARROW means press the left arrow.

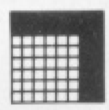
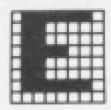
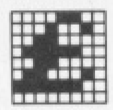
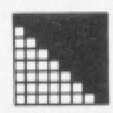
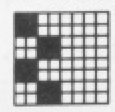
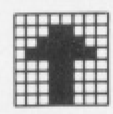
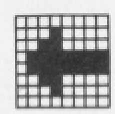
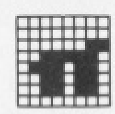
Any number of mnemonics can be enclosed in brackets for example

[SA10,SPC10,SA10]

means type 10 shift A's 10 spaces and another 10 shift A's.

Mnemonic	Symbol	what to press
[RIGHT]		left/right
[LEFT]		shift left/right
[UP]		Shift & up /down
[DOWN]		up/down
[F1]		f1
[F2]		shift & f1
[F3]		f3
[F4]		shift & f3

Mnemonic	Symbol	what to press
[F5]		f5
[F6]		shift & f5
[F7]		f7
[F8]		shift & f7
[CLEAR]		shift & CLR /HOME
[HOME]		CLR/HOME
[RVSON]		CTRL & 9
[RVSOFF]		CTRL & 0

Mnemonic	Symbol	what to press
[BLACK]		CTRL & 1
[WHITE]		CTRL & 2
[RED]		CTRL & 3
[CYAN]		CTRL & 4
[PURPLE]		CTRL & 5
[GREEN]		CTRL & 6
[BLUE]		CTRL & 7
[YELLOW]		CTRL & 8

WELCOME TO THE MACHINE

In part three, Allen Webb adds more to your growing machine code skills.

HELLO AGAIN, READY FOR YOUR NEXT dose of ecstasy? Well, last month's homework was pretty simple, wasn't it?

Question one really followed on from the simple example in the last part. It simply writes CAT in white letters in the top left hand corner of the screen. It won't take much looking, however, for you to notice that it's a rather poorly written routine. By the end of this month's episode you'll be able to write it in a much slicker way.

Listing 1 shows the routine again written using the format of the HYPA Basic assembler (see Your Commodore March issue). Lines 110 to 160 put the "POKE" values of C, A and T on to the screen. Lines 170 to 200 colour the letters white.

Listing 1

```
10 ASSEMBLE 100,1
100 REM *=$C000
110 REM LDA 3
120 REM STA $0400
130 REM LDA 1
140 REM STA $0401
150 REM LDA 20
160 REM STA $0402
170 REM LDA 1
180 REM STA $D800
190 REM STA $D801
200 REM STA $D802
210 REM RTS
220 REM ]
```

Question 2 actually asks you to write a routine. Listing 2 gives one solution. Location 1000 holds a value which is put into the screen colour.

You call the routine with:

POKE 1000,COLOUR: SYS 49152

Listing 2

```
10 ASSEMBLE 100,1
100 REM *=$C000
110 REM LDA 1000
120 REM STA $D021
130 REM RTS
140 REM ]
```

Lastly, question 3 asks you to play games with the border colour. Listing 3 does this. The Y register holds the border colour and is incremented to change the border.

Listing 3

```
10 ASSEMBLE 100,1
100 REM *=$C000
110 REM LDY £2
120 REM STY $D020
130 REM INY
140 REM STY $D020
150 REM INY
160 REM STY $D020
170 REM RTS
180 REM ]
```

If you try this routine, you will not notice any effect except for the border turning purple. This is simply due to the speed of the routine. If you repeatedly call the routine as with the Basic line:

10 SYS 49152: GOTO 10

You will see a purple border with intermittent lines.

Again, this is a messy bit of programming. Let us consider a simple loop. In Basic, you loop by testing a variable and branching to a specified line. Machine code uses a similar approach. Consider Listing 4:

Listing 4

```
10 ASSEMBLE 100,1
100 REM *=$C000
110 REM LDY £2
120 REM .LOOP: STY $D021
130 REM INY
140 REM CPY £4
150 REM BNE LOOP
160 REM RTS
170 REM ]
```

Line 110 sets the Y register to the initial value. Line 120 sets the border colour. Line 130 increments the Y register and line 140 compares the Y register to four. If thevalue of the Y register is not equal to four then the code jumps to the label LOOP and continues execution. When the Y register contains four, the routine ends. This is a much better routine than Listing 3. The instruction CPY £4 assembles to two bytes. The first byte is the code for CPY (ComPare Y). The second byte holds the number of bytes through which the program counter must be adjusted to jump back to the label LOOP (offset). I don't intend to go into how the offset is calculated since most assemblers and disassemblers deal with the problem for you. CPY can be used in three addressing modes:

Absolute, for example CPY $100
Immediate, for example CPY £2
Zero Page, for example CPY $FF

Naturally, there is an equivalnent command for the X register:

CPX (ComPare X)

You will still find that the routine is still pretty fast. As is the case with many applications, you may find it necessary to slow down machine code. A crude method is to use the NOP (No Operation) instruction. This instruction does absolutely nothing! Surprisingly enough, it has some uses:

1) To deliberately introduce minute delays to fine tune timing.
2) To eliminate unnecessary code without reassembling your code.

Perverts who write using an assembler based in a machine code monitor will use NOPs often since it's an easy way of leaving space for additions to code. Try stuffing a few NOPs in listing 4 between lines 120 and 130 and see what happens.

Last month I described the simplest addressing modes. Whilst they are invaluable, their versatility is limited. The next mode uses a simple indexing with the X or Y register. Depending on the memory locations position, this acts in either absolute or zero page modes. Here are some examples:

Absolute Y indexing LDA $1000,Y
Zero Page X indexing STA $0D,X

This mode is quite simple to understand. The Y or X register acts as a counter specifying an offset from the specified address. The microprocessor adds the offset to the address and

performs the instruction on the resulting address. Consider the instruction:
STA 1024,Y
If the Y register contains 0, then the accumulator will be stored in location 1024 (1024+0=1024). If the Y register contains 1, the accumulator will be stored in location 1025 and so on. It therefore follows that we have a simple way of performing actions on a row of locations of up to 255 characters length (Y and X are 8 bit registers – remember?). This can be used to rewrite program one of last month's homework. Consider listing 5:

Listing 5

```
10 ASSEMBLE 90,1
90 REM *=$C000
100 REM LDY £0
110 REM .LOOP: LDA TABLE,Y
120 REM STA $0400,Y
130 REM LDA £1
140 REM STA $D800,Y
150 REM INY
160 REM CPY £3
170 REM BNE LOOP
180 REM RTS
190 REM .TABLE: £B:3,1,20
200 REM ]
```

Line 190 holds the "POKE" values of CAT as a table of three bytes. We enter the routine with Y containing zero. During the first pass, the accumulator is loaded with the first byte in the table (line 110) and this is put in the top left hand corner (line 120). The colour screen is set to white (lines 130 and 140). The Y register is incremented and loops back to process the second letter, if its value is not equal to three (line 160).

This, I hope you'll agree, is neater than the original version. Whilst the size is not greatly reduced, once you start writing large routines you'll see the difference.

Before I move on to the next form of addressing, how about a small diversion? It won't take a lot of thought to spot that Listing 5, or something similar, can be used to print blocks of text. There are two ways of printing text:
a) Direct moving of text as in Listing 5, or
b) Printing it in the same way as printing a string in BASIC.

In the C64's ROMs are two useful routines which can be readily used. First we have a routine starting at location $FFD2. This acts in the same way as PRINT CHR$(X). To use it you simply load the Accumulator with the character to be printed and call the routine. Rewriting Listing 5, we get:

Listing 5

```
10 ASSEMBLE 90,1
90 REM *=$C000
100 REM LDY £0
110 REM .LOOP: LDA TABLE,Y
120 REM JSR $FFD2
130 REM INY
140 REM CPY £3
150 REM BNE LOOP
160 REM RTS
170 REM .TABLE:$CAT
180 REM ]
```

This prints CAT at the current cursor position in the current cursor colour. The text is stored in line 170 as ASCII codes and we don't need to worry about updating the colour matrix. The JSR (Jump SubRoutine) is the same as GOSUB in Basic.

We can simplify matters further, by using a routine in the Basic ROM at $AB1E. This prints a whole sentence for you. Two requirements must be fulfilled:
i) The sentence must end with a zero byte.
ii) Before calling the routine, you must load the Y register with the most significant byte of the start address of the sentence, and the Accumulator with the least significant byte. Do I hear grunts of confusion. OK, here's a quick tutorial. Assume that the sentence starts at the address $C010. This is stored as two bytes, $C0 and $10. The high byte, $C0, is called the most significant byte and the low byte, $10, is the least significant byte.

Here is our example again:

Listing 6

```
10 ASSEMBLE 90,1
90 REM*=$C000
100 REM LDA £< TABLE
110 REM LDY £>TABLE
120 REM JSR $AB1E
130 REM RTS
140 REM .MESSAGE: $CAT
150 REM £B:0
```

Lines 100 and 110 take care of loading the message start address. £< means the least significant byte and £> the most significant byte. Line 150 holds the terminating zero byte. (try omitting it and see what happens!)

We now have a very short, but rather slow, routine. It's slow because it uses the rather lengthy print routine in ROM. If you want to write an adventure, use the approach used in Listing 6. If you want to write a fast game with flicker free graphics changes, direct data movement will be necessary.

The main drawback with simple indexing is that you specify the start address in the object code and this can only be changed by directly altering the object code when the code is running. In otherword, like rewriting a Basic program while it's running. Whilst this is a perfectly acceptable technique. I'm not that keen on it. A better approach is to use an alternative indexed mode called Post-Indexed Indirect Addressing. This is rather a grand name for a fairly simple idea. In simple indexed addressing, you will recall that we specified the address concerned in the mnemonics. eg:

LDA $1000Y

In Post-Indexed Indirect Addressing, we store the address in a zero page location and specify that address in the mnemonics. Note that we use brackets to signify this mode:

LDA ($FB),Y

The action of this instruction is to add the offset kept in the Y register to the address stored in the byte pair $FB and load the accumulator with the contents of the resulting address. The address is stored with the low byte first as usual. Here is an example:

The equivalent instructions for:

LDA $C010,Y are:
LDA £$10
STA $FB
LDA £$C0
STA $FC
LDA ($FB),Y

If Y contains five, the instruction adds five to the address in $FB, $FC giving $C015. The accumulator is then loaded with the contents of $C015.

Consider:

Listing 7

```
10 ASSEMBLE 90,1
90 REM *=$C000
100 REM LDA £<TABLE
110 REM STA $FB
120 REM LDA £>TABLE
130 REM STA $FC
140 REM LDY £0
150 REM .LOOP: LDA ($FB),Y
160 REM JSR $FFD2
170 REM INY
180 REM CPY £3
190 REM BNE LOOP
200 REM RTS
210 REM .TABLE: $CAT
```

Compare this to Listing 5. Lines 150 to 210 correspond exactly to lines 100 to 180 in Listing 5 (except for the different addressing of course). Lines 100 to 130 put the start address of the message into the zero page locations $FB and $FC.

Whilst this routine is more complex than the earlier versions, it has one powerful virtue – it is easier to change the address processed. You should also notice that this addressing mode uses the Y register only.

I'm sorry that this may appear a little complex, things should be clearer as we deal with further examples in later parts of the series. Here is a summary of the addressing modes described this time.

	ABSOLUTE,Y	ABSOLUTE,X	ZERO PAGE,X	ZERO PAGE,Y	(IND),Y
LDA	*		*		*
STA	*	*	*		*
LDX	*			*	
STX				*	
LDY		*	*		
STY			*		

OK, agony time. Two problems for you to consider.

1. Write a routine which draws a line of stars along the top of the screen.

2. Write a routine which puts the character set on the screen.

Next month I'll deal with one more addressing mode and we'll move on to more on looping and other mysteries.

WELCOME TO THE MACHINE

Stuart Cooke risks life and limb reviewing Mastertronic's Ski Writer.

MASTERTRONIC

ON ■ THE ■ PISTE?

Mastertronic is extremely well known for production of cut price software. Not a week goes by without a large number of Mastertronic's releases being quite high in the software charts. Well, Mastertronic is about to do it again with a range of cut price application software.

The first venture into this market is the launch of Ski Writer. This is a wordprocessor that has been available in the good old US of A for quite a while and has received a large amount of good publicity becaue of its ease of use. The price for this package over here is a meagre £14.99.

So what does Ski Writer offer? Well it's a full implementation of a wordprocessor with enough features to suit most people. There are however a few items missing that would have made this package superb, but more of this later.

Documentation

The manual for this package could almost be described as non-existent. It consists of three pages of very small printed instructions, the aim of which is simply to tell you how to load the package and what keys do what.

Mastertronic says the reason for the lack of documentation is that the package is so easy to use that a manual is not necessary. After using the package for some while I'm afraid that I must agree with them.

In Use

Upon loading the program you are presented with the programs main menu. From here you can select Edit, this allows you to enter and alter text. Preview allows you to see how your text is going to look on printed paper before you attempt to print. Print will allow you to check dot lines — more about that later — change the printer type, change paper type and print your document. File gives you all of the file manipulation commands such as LOAD, SAVE and MERGE together with a few disk commands such as FORMAT. Facilities to use disk or tape for your documents is included.

One of the main reasons for the ease of use of this program is the very comprehensive help function. Whenever you are in text mode help can be obtained on all of the following subjects:

New Users
Typing/editing
Formatting
Previewing
Printing
Cassette filing
Disk filing

All subjects are covered in quite close detail so if you have any confusion about a subject then one of the help files should make things clear.

Dot lines

Dot lines allows you to alter the layout of your finished document. A dot line is entered by placing a dot '.' followed by a one letter commmand and a number. Obviously it is very difficult to remember single letter commands so if you select the Edit menu followed by the format menu all of the available commands will be displayed and you can select the one that you require using the cursor keys. One important thing worth noting is that all the available functions are listed at the bottom of the screen. For example, when editing text the bottom of the screen reads:

F1 HELP, F3 Edit Menu, STOP Main Menu.

Selecting one of these will move you on to another sub menu. For example pressing F3 will display the following:

Find, Replace, Format, Mark Copy and Cut.

As you can see everything is always easy to find and you don't have to remember a lot of functions. Anyway, back to the dot commands.

The dot commands available allow you to set up the following:

The line spacing
Left and right margins
Top and bottom margins
Start page number and page numbering at the top of a page
Insert comments into your text
Justify the text

As you can see there are quite a number of formatting options open to you. There are however a few more commands. These are obtained by holding down combinations of keys and you can't get them from any menu. This means that the ones you do not use often are likely to be forgotten. Don't despair however as they are all documented in the help section. Some of the other commands available include underline and delete functions. Delete takes some time to get used to as it differs from the usual delete on the C64. The DEL key instead of deleting to the left of the cursor deletes the character under the cursor and moves the one to the right to that position. If you want to delete in the normal way, as you would when typing a line in Basic, you have to use the left arrow key. This leads to total confusion and you usually end up deleting the wrong piece of text. Why couldn't delete have been kept as it normally is?

Omissions

If you intend to use a Wordprocessor for serious work then there are a couple of serious omissions, one of these is a word count and another is the provision of headers and footers. If you are given the task of writing a certain number of words, as you would when writing a magazine article then you need a word count. If one isn't present then you have to resort to counting them by hand, not a fun job. Headers and footers are necessary on many documents for example you may need to put your name, the name of the document and the page number on top of each page on a college report, with Ski Writer this cannot be done.

Verdict

Despite a small number of flaws you can't really knock Ski Writer at a price of £14.99 it is an excellent buy. Not only is it adequate for most tasks it is also very easy to use, this is very important.

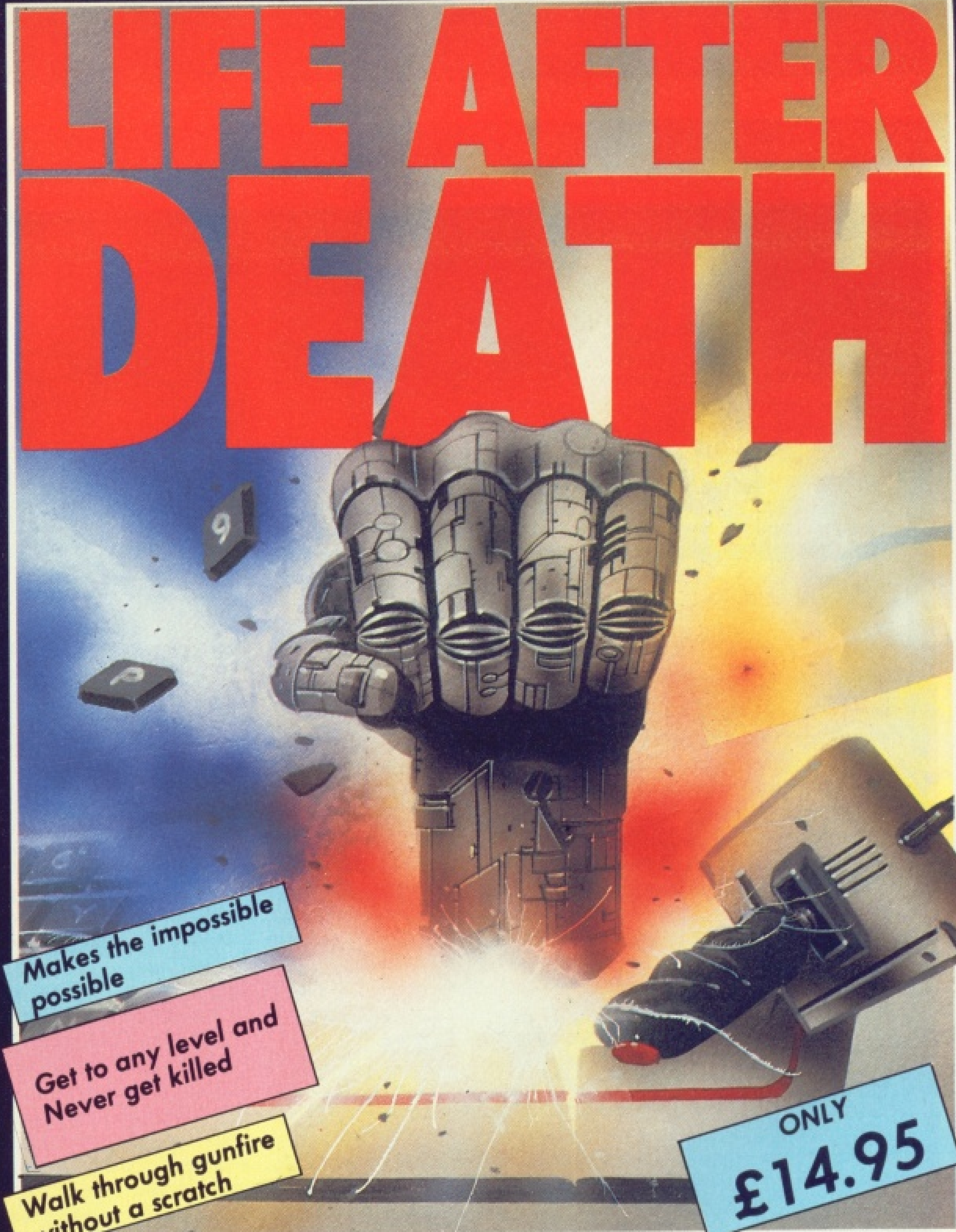
If you are looking for your first word processor or one that is easy to use you won't go wrong with Ski Writer.

Touchline

Ski Writer
Mastertronic
£14.99

GAME KILLER

LIFE AFTER DEATH



Q. *What is Game Killer?*
A. ***A revolutionary powerful cartridge that now lets you play all those impossible games without being killed!***
Walk fearlessly through gunfire, disaster and danger without a scratch.
Q. *Sounds difficult.*
A. ***It's simple. Just plug it in the back of your computer and press a button.***
Q. *You mean I can play my games all the way to the end. I don't believe it!*
A. ***Yes – incredible but true! It works on all those thousands of games with sprite collision.***
Q. *Sounds like science fiction! I suppose it's available in 2001.*
A. ***It's here now!***
Q. *I'll believe it when I see it!*
A. ***Exactly, so why don't you go to your local computer shop.***

The **Robtek** Gamekiller is available from all good computer dealers.

Enquiries to **Robtek** (*formerly known as Robcom*) Ltd., 36 Market Place, Falloden Way, London NW11 6JP. Telephone: 01-209 0118.

Patent and copyright applied for

COMMODORE 64/128K
OTHER FORMATS AVAILABLE SOON!

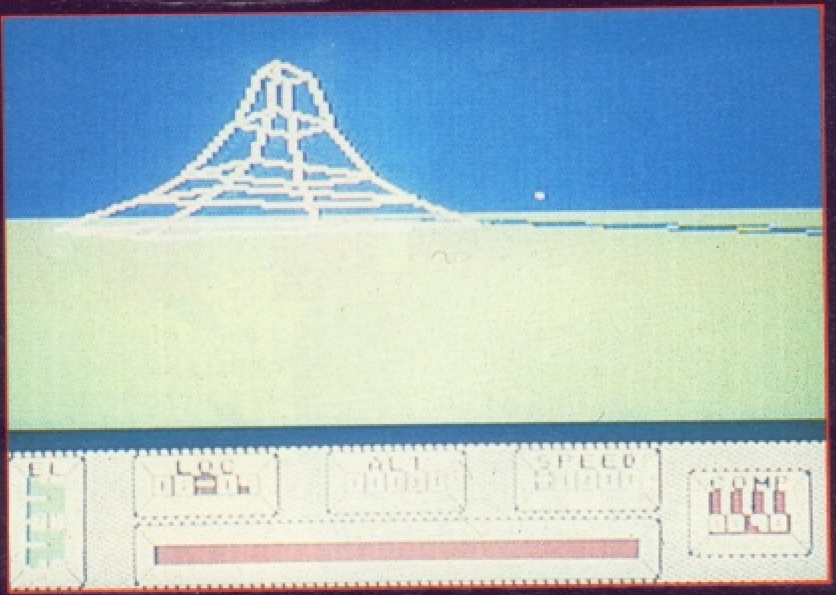
Please send me ______ Gamekiller/s (£14.95 each
I enclose cheque/Po for £ ______ including 50p p+p
My Visa no. is
Address
Code
Allow up
28 da

ROBTEK

Mercenary

Novagen C64 £9.95 cass, £12.95 disk

Originality 7 Playability 8 Graphics 9 Value For Money 9



YOUR SPACECRAFT HAS BEEN forced to crash land on the planet Targ. Unfortunately you soon find out that the inhabitants of the planet, the Palyars and the Mechanoids, are at war with each other. You are on your own, apart from your trusty computer, whatever you do from now on is your choice, though if you are lucky your computer may advise you.

The main aim of the game is to get yourself enough money and experience to get another spaceship and off the planet. Mind you if you were feeling up to it you could help one of the waring factions out and earn some money as a mercenary. In fact when you start you are given the option of spending some of the money that you have in your possession on a craft that belongs to a player, they even offer you the opportunity of some work. Of course it is up to you if you buy the craft or not but it is a very long walk around the planet if you don't.

Most of the action in this strange combination of adventure program and flight simulator, takes place over a very large 3D landscape. Buildings, bridges and other craft are all extremely well defined using vector graphics, as used on the arcade battle zone game.

If you accept the Palyar's offer of employment as a mercenary, you must find your way to their briefing room, you are given the location so you should not have too many problems getting there. Did I say no problem? It took me quite a few hours and many games to find the lift that would take me down into the Palyars complex.

The flight simulation element of the game comes into play once you are in the ship. The flight simulation is not exactly difficult, you only have a speed indicator, altimeter and compass, but it is great fun especially if you fly close to the ground as you can see the 3D buildings getting larger as they come towards you.

Not all of the action for this game takes place on the surface of the planet. Somewhere in the city is a lift that will take you down into an underground complex. This section of the game offers nothing really thrilling. In fact it is really just an extension of the old 3D maze type games. Even so, careful exploration of this extension to the city is vital as you will find many useful items scattered around in the many underground rooms, including some cross hairs that can be added to your craft to help you shoot down enemy craft.

Not only will you come across objects that will help you but you'll also find a great number of puzzles. Locked doors stop you from getting around the complex too easily, you'll need to find a key to get through these. To make matters even worse there are rooms which will move you great distances around the complex, this really helps in getting you lost.

As previously mentioned you are the one that controls the action. If you want to go around shooting things up then that's up to you. However, don't be surprised if you find yourself been blown out of the air by enemy gun ships.

Mercenary is certainly a strange game to play as there are no set rules. Some people may like this but if you are just after a good shoot 'em up then you probably won't. It is possible to spend quite a lot of time feeling that you are getting nowhere, but exploratiocn is important and it is worth mapping out as much of the city and the underground complex as possible, this will make it a lot easier to find your way around in a hurry, or even your way out of the complex and back to your ship. As mentioned, it's very easy to get lost and you can spend hours just going backwards and forwards in your search for the exit.

Mercenary is an extremely time consuming game and isn't one that you will load up for a quick five minutes. There is however a save game option so you don't have to worry about getting killed. If you do get killed you will find yourself by a new ship anyway.

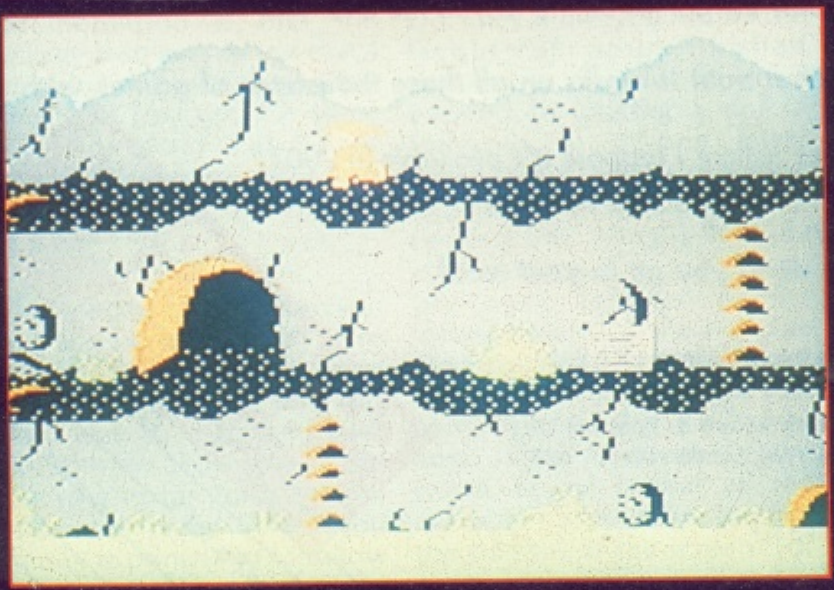
If you are looking for a challenge and something to keep you occupied for a number of hours then take a look at Mercenary, it's great fun.

S.C.

Time Tunnel

US Gold £9.95 Joystick required

Originality 7 Playability 6 Graphics 6 Value For Money 7



THE GNOME KING IS LOOKing for a successor. In order to prove yourself worthy, you must travel through seven time zones, finding a page of manuscript in each. If you can decipher the final message you will be able to set free many gnome spirits and be elected king.

Starting off in the gnome mansion, you soon discover how to select a time zone and operate the time machine that will transport you to the year of your choice. Amongst your options are the stone age, ancient Green, the California gold rush and an intergalactic spaceship.

You can only hold one object at a time but can access a storeroom which will hold up to four items. Pressing the fire button performs various actions according to a list of priorities. It may operate a mechanism e.g. open a door, drop something, pick up an object or fire a lightning bolt.

You can always return from a time zone to the mansion but sometimes time holes appear that transport you to another year. This will generally be useful, though, and you will probably be able to find something in the new zone to help you in the old one.

Time Tunnel is an enjoyable arcade adventure. The graphics are pleasant and there are some jolly tunes and enough puzzles to keep you quiet for a reasonable length of time.

G.R.H.

Captain Kidd

Bug-Byte £2.95

Originality 4 · Playability 6 · Graphics 8 · Value For Money 8



THIS IS A VERY SIMPLE AND quite addictive little arcade game which bears a vague resemblance to Pac-man.

You control a little character called Captain Kidd (in reality he's just a head who rushes around the board, I don't know what happened to his body!) This poor little dismembered cranium dashes around defusing bombs to stop himself getting blown to kingdom come.

There are of course adversaries to avoid and in this particular game they take the form of boots which are ready and willing to stomp on you at any given moment. At first they're not too difficult to avoid but as you reach the higher levels they multiply drastically as do the bombs. There are also numerous squares on the board which are marked with a skull and crossbones and if you touch these then you dissolve instantaneously.

All the screens are identical except that you get a different background colour each time and of course more skulls and more boots. There are also lots of little marker flags which can gain you extra points.

It's a very simple and a very old idea. You've probably got a lot of games like it at home. Having said that, I don't think you'll be wasting your money and you get a nice little rendering of The Entertainer in the background.

M.C.

Ace

Cascade £10.95 Plus/4

Originality 3 · Playability 8 · Graphics 8 · Value For Money 9



THE PLUS/4 SUFFERS FROM A severe lack of commercial software.

ACE finds you in control of an Allied jet, your mission is to stop the advance of enemy units.

Ground forces consist of missile batteries and helicopters. These are graphically very good, all objects getting larger as you fly past them and the helicopters complete with moving rotors.

In the air you will have to avoid the numerous enemy planes that always seem to come at you from behind, thank goodness you've got a rear view camera. Once you've destroyed all of these then it's on to the ships. Your aim, sink the retreating force.

Obviously all this flying around and being shot at is going to leave your plane in need of repairs. No problem here, simply call up the map, find your nearest base, and land on the runway. If you're really lucky then you'll find a refuelling plane in your area, catch this up and you can even refuel in flight.

As previously mentioned this game has some very realistic graphics. If you are daft enough to fly low you will see the hills and even the trees as they whizz beneath your plane.

ACE is a game that no Plus/4 owner should be without, it will keep you occupied for hours.

S.C.

The Great Gonzo in Wordrider

US Gold — Kids!– £14.95 disk only

Originality 7 · Playability 10 · Graphics 8 · Value For Money 8



THE FAMOUS MUPPET CHARacter, The Great Gonzo, is on a mission to save his friend Camilla the chicken from being the main ingredient in the Swedish chef's coq au vin. It's probably an idea to include a warning with this adventure: it's a chock-a-block with the most appalling puns in true Muppet style.

It's a joystick operated text adventure in which Gonzo is given a series of options in choosing a vehicle for the particular terrain in which he finds himself. You can have a rolling horn blower, a diving light maker or even a walking bumper. There are several options and you must make sure you pick the correct one for your present location.

The locations have chicken flavoured names, for instance, the Egglantic Ocean, New York City and the Egg-yptian Desert.

You need to amass a minimum of 75 points to reach the castle where Camilla is being held captive. You score points for successfully negotiating hazards and also for conquering the foes you meet on the way, like sharks, eagles and even wild goats.

Some of the screens involve dodging flying birds and bouncing eggs while others are maze type settings.

It's very entertaining and the instruction booklet also contains a Muppet story. Eggsactly what the doctor ordered!

M.C.

Desert Fox

US Gold £9.95

Originality 7 Playability 9 Graphics 7 Value For Money 8



EVERY SO OFTEN • A GAME appears thta first impressions would leave you to think that it was a load of rubbish, the only thing is that a few hours later you find yourself still playing it and going back to play it time and time again. Desert Fox from US Gold is one of those games.

Desert Fox is a combination of both arcade and strategy games. You play the part of the Allied forces and must save all your depots before they are take over by Rommel's army. Lose one depot and the game is over.

Upon loading you are presented with a map of the area in question, depending on the level of play a varying number of flags are present, these represent the bases that you must rescue from the clutches of the evil Rommel. A number of icons – small pictures – represent the options that are available to you.

Selecting the Zoom icon allows you to find out information on a selected base. The information given is; the number of enemy tanks present, the number of your tanks present, how much fuel and supplies are there and, perhaps the most important, the number of hours before the depot is over run. The number of hours of freedom remaining for the selected site is also shown on an indicator at the bottom of the screen, this gives you an indication of just how long you have got to get there and rescue your troops.

The Radio icon turns on your tank's radio. This can be directed where you want, pressing the fire button gives you a surprisingly easy to understand radio message about what lies in this direction.

The move icon will move your tank, known as Lone Wolf, in the direction that the radio beacon is facing. Careful use of this icon together with the radio icon will allow you to travel around the map avoiding the enemy as much as possible.

If you are unlucky enough to fall for one of the enemy's little traps then you will enter the arcade sequence of the game. In all of the sequences the graphics and sound can only be described as adequate but are fairly realistic and surprisingly quick.

If you meet up with a convoy you have to protect it from enemy planes that are trying to blow it up. Your job, shoot down the planes, avoid the allied ones or you will lose points. The cross hairs for your two sights automatically move to the position of any planes, simply move the joystick left or right to fire the gun.

Tiger finds you under attack from enemy tanks, you can spot them on your radar and hear their missiles screaming towards you. With careful aim you can shoot the enemy shells, if you shoot the tank then their shells disappear as well. Your missiles can be guided so even if the tank is moving you stand a good chance of blowing him to pieces, not before he has had a good go at you, though. Each hit by the enemy will cause some damage to your tank, this can be repaired at one of the depots.

In minefield you suddenly find your tank completely surrounded by mines. Your aim is to get out of there alive. You can shoot mines that are in front of you so this helps to clear a path. If you do hit a mine then of course you are damaged and you also get stuck in the sand wasting valuable time.

Ambush is reminiscent of the section in the Star Wars arcade game, the bit where you are flying down canyon being shot at from the sides. Here your tank is going through a canyon, the enemy has gun emplacement on both cliff faces. You must destroy them before they pass your tank, if you don't then you will suffer damage.

In Stuka Lone Wolf is being attacked by enemy fighters. This section of the game is very similar to the Tiger tank section, shoot the enemy with your guided missiles before they hit you.

Desert Fox offers enough variation throughout its play to keep you interested for a long time. The different levels offer such a varying degree of competition that you start to take the attitude that as soon as one level is finished you must have a crack at the next one. If you're after a good shoot them up then have a go at Desert Fox.

S.C.

Comic Bakery

Imagine £.95 Joystick required

Originality 3 Playability 3 Graphics 7 Value For Money 3



BASED ON THE ARCADE game from Konami, Comic Bakery sees you playing the part of a baker trying to bake and deliver as many loaves as possible between the hours of nine a.m. and five p.m. As the factory is automated, it ought to be easy but you are hampered in your work by some pesky raccoons.

There are three switches on your conveyor belt which the raccoons delight in turning off. Fortunately, you have a stun gun with which you can put them to sleep for a few seconds and kick them out of the way. If you touch them when they are not stunned, you lose one of your three lives. Another raccoon runs above the conveyor belt, stealing loaves. He can be stunned by leaping up and firing.

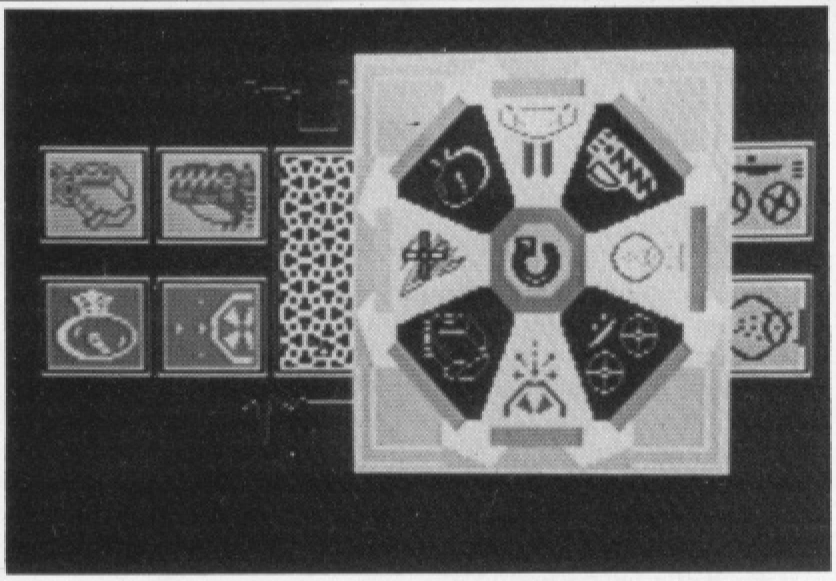
A radar at the top of the screen keeps you informed of what's going on. You must also keep your eye on the number of shots you have left although you do regain them in time. Points are scored for stunning and kicking raccoons and switching the machines back on. At the end of the day, you get a bonus for each loaf baked and progress to the next level although there is no increase in difficulty.

The graphics are bright and colourful and the music and sound effects are excellent but the game is far too easy to play and lacks any lasting appeal.

G.R.H.

Zoids
Martech £7.95

6 8 9 8



THE PLANET ZOIDSTAR LIES millions of light years from earth. Here the Zoidarians manufactured their war machines the Zoids, and the story goes on.

Now there are two types of Zoids, red ones and blue ones. You play the part of Earthman, a man from no guesses where, who is going to merge minds with the blue zoids ultimate weapon, Zoidzilla, and take on the evil red zoids from within their own complex.

However, as you descend into the heart of their city your craft is blown up and you see Zoidzilla disperse across the landscape.

Red Patrols find these pieces of Zoidzilla and carry them off to eight of their city domes. Your task now is to find the eight pieces and then destroy the red army.

Of course, as with all good stories, you manage to escape from your ships destruction with a very useful piece of equipment. Tank Zoid (what really exciting names!), you merge minds with it and you become as one.

All of the action in Zoids takes place within the area surrounding the Red Zoids' cities. Your position within this city is depicted upon a small map of the area around your tank, in the middle of your screen. You don't see anything as it really is as you are seeing everything through the eyes of Tank Zoid. If you ask me this is a very good excuse for making what could have been very interesting graphics appear on the screen as simple blocks of colour. Yes, you guessed it, you're blue and the enemy's red.

Around the map you will find a number of icons. These show all of the equipment available to you and its status. Above the map is your pulse, below is that of the zoid. Careful monitoring of these will show you what state both are in.

Next you have the Mode or Weapon icons. The Railgun propels electromagnetic pulses at your enemy. You can fire normal missiles and attempt to jam the enemy's signals.

Lastly you have information about your zoid, damage reports and that sort of thing.

Moving your pointer over the map allows you to specify a direction in which you want your Tank Zoid to move. It will continue moving in the specified direction until it can go no further. This allows you to watch the map for lurking Red Zoids as they are bound to take a few pot shots at you as you drive past.

Combat in Zoids is a little strange and not that exciting. If you are using the railgun you are presented with a diamond shaped sight, you have to centre the enemy, represented by another diamond, in your sights and fire. This may sound graphically boring but to be fair it isn't. Martech has done a good job of making all the graphics look pretty even if they are a little basic.

Firing missiles is a lot more complicated. You are presented with two map grids. One showing your enemy from above the other from the side. You have to select how much fuel to put in your missile, fire it and then guide it to your target. You control the missile on one map at a time, press the button to move between the maps. Action here is a little fast and I found it took quite a while before I was used enough to the controls to hit anything. Again nothing stunning but good enough.

An exciting musical piece by Rob Hubbard helps to set the scene for the game. Though I get the feeling that he sets it too well and the game doesn't quite live up to it. To be fair though, even though Zoids is probably not the most visually stunning game around, there is a lot to it and it will probably take a long time to master.

The action is fast and furious, get three or four Red Zoids on your tail and the only option open to you is to run. Of course you don't have to but I bet you'll end up starting the game from the beginning again.

Zoids is very different to any other game and must be played for quite a while before you get the hang of it and really start to enjoy it. If you can't be bothered to spend a long time on a game then Zoids probably isn't for you. If, on the other hand, you enjoy a challenge then the Red Zoids are waiting.

S.C.

Ark Pandora
Alligata £9.95

8 9 7 9



ARCADE ADVENTURES ARE A type of game that are becoming extremely common at the moment.

As with any normal adventure the game must have an aim. In Ark Pandora you must retrieve the sacred scroll which is hidden on the island. While travelling in your search for this mysterious scroll you will meet both friends and enemies. Friends can be persuaded to help you in your task while the enemy will do his best to kill you off.

Nothing unusual here I here you say, well no there isn't. The main difference between this and many other arcade adventures is its presentation. Firstly all of the graphics are extremely colourful and very well animated, the running and jumping action of characters being one example. Secondly, most of the action is icon controlled. Pointing to the icons allows you to use objects, pick them up and put them down, select which way you wish to go once you reach the edge of the screen and that sort of thing.

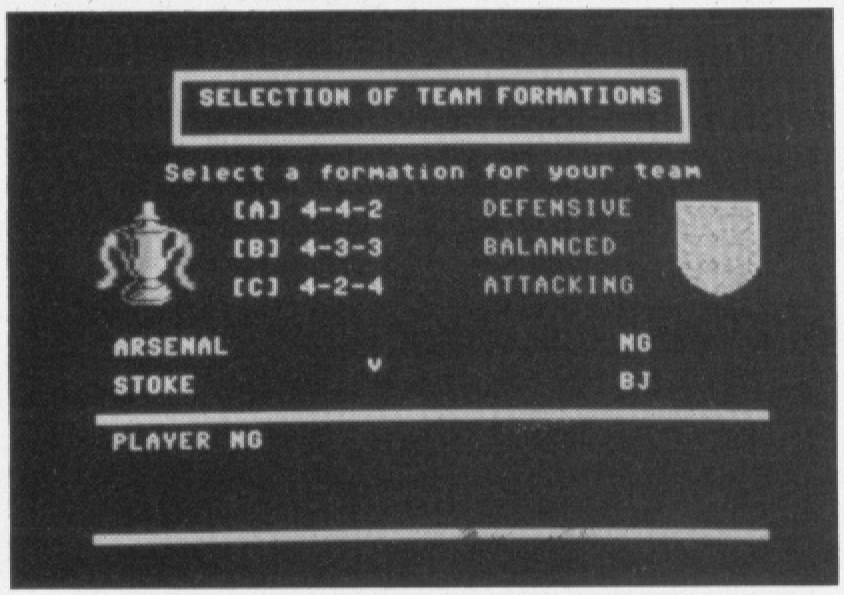
When you get fed up with the game, which will take a long time as some of the puzzles are extremely complex, you don't have to put this game in the box with all your other 'dead' programs. Simply break out the screen designer that comes with the packages and create your own new screens.

S.C.

FA Cup Football

Virgin Games £7.95

Originality 6 · Playability 9 · Value For Money 9



IT'S QUITE SURPRISING THAT nobody's ever done an official FA Cup program, however Virgin has now rectified that situation with this new text only game.

As a football manager, you are in charge of 10 teams (it's hard work these days in the soccer business). The aim of the game is, of course, to get one of your teams to the final at Wembley and then thrash the opposition.

One of the game's strongest points, in my opinion, is that it can be played by up to eight people at once. I've never had a game against the computer alone but I think that would become a little tedious. When there are several people competing it's pretty exciting and you can become very involved in your teams' performance.

You start by choosing your 10 sides from a choice of 124 possible teams. Any ones left over are managed by the computer. It's quite a good idea to pick a few non-league teams since they can surprise you with occasional flashes of brilliance although I've never succeeded in taking one past the fourth round. The league clubs have all been given a real home and away rating based on their performance in the FA Cup over the last few years and also on their current league form. From the little I know about soccer it seems to be fairly accurate, although there is always room for surprises. Non-league clubs have a rating based on FA Cup history and recent results and attendances.

Once you've chosen your sides then you watch the draw. Two little tokens roll on to the top of the screen and the names of the sides drawn against each other appear at the bottom and scroll upwards. In case you haven't kept a record of your teams, don't worry because each manager's initials appear next to the names of his sides.

Once you've found out who you're playing, a screen appears on which you must indicate your team's tactics. These can be defensive, balanced or attacking. You are given this option for all your teams and in the first two rounds, where only non-league and third and fourth division clubs play, this is the only opportunity you have to guide your teams' progress in a particular match. Later when the big boys join in, you are given more opportunities to decide tactics, and these increase as you get nearer the final. Eventually you reach the stage where you can advise your team four times during a match and you are even given the option of bringing on the sub.

There are also news flashes about various events which can affect your teams' morale. Your star player is having dodgy dealings with a ticket tout. Your goalie went out on the razz the night before the match and has a dreadful hangover. However, good things happen too – I was several times voted manager of the month! Although, once you've played the game a few times, you'll probably find that you've read all the news flashed and you'll begin to give them a miss.

There is a state of play screen which shows how all the teams are doing in their current matches. Ninety minutes is clocked up in an equivalent number of seconds and you can speed this up if you like. It's amazing how many goals seem to be scored in the final minute of the game. I was leading Chelsea to a cup final win against Manchester United and was two nil up. In the final minute my worthy opponents managed to score a staggering three goals! This circumstance detracts a little from the authenticity but certainly adds to the excitement. You can never be sure of a win until the final whistle blows.

When you reach the final you are forced to make quite a few skillful decisions. Whether to agree to transfers for your best players, how to prepare them for the match etc. These all affect the team's performance so choose your answers carefully.

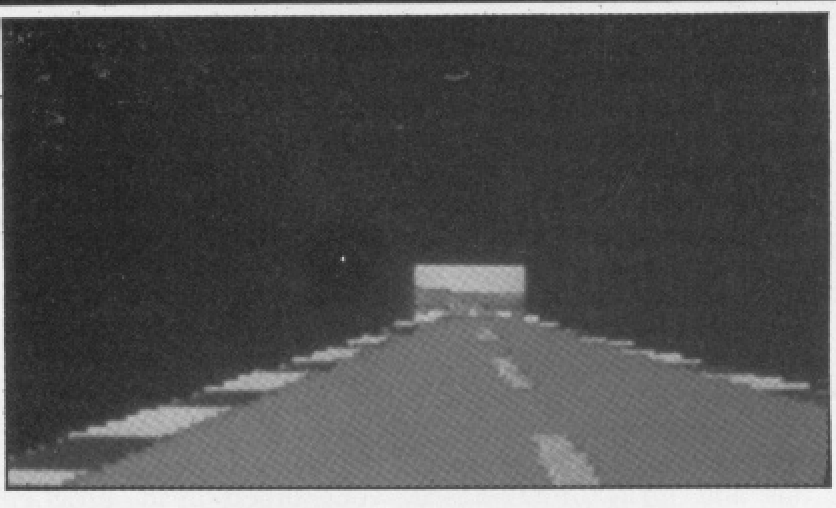
One last point – you don't need to be an avid football fan to enjoy this game. I'm not. Get a few friends together and go out and buy it.

M.C.

Elektraglide

English Software C64/128 £8.95

Originality 7 · Playability 7 · Graphics 8 · Value For Money 7



THIS GAME BENDS OVER backwards to pretend that it is not a racing game like Pitstop or Pole Position.

The game has you behind the wheel of a speedy racer which you must steer around the winding roads of Britain, America or Australia avoiding obstacles which appear in your path. Intelligent spheres, boxes, oil patches and electrostatic columns dropped from overhead rockets. No problems about burning the rubber off your wheels or running out of road. Any oversteering is penalised by a drop in speed and your race is to get from A to B before your time runs out.

Every time an obstruction is hit the car thumps to a standstill causing precious seconds to tick by. If the course is completed within the allotted time, any time remaining is added on to the next, more difficult run.

Although the cassette insert goes to great lengths to disassociate itself from similar 3D simulations, a short period of deep thought will convince you otherwise. Imagine the obstacles are cars, they appear at random looming up from the horizon. Might just as well be a sphere or a box. Sorry about the dogmatic approach but this is not really different to anything already on the market. It is fast, and frantic fun and recommended for those who are tired of staring up hi-res exhaust pipes.

E.D.

A Flash Of Genius!

THE NEW 64 MULTIMODEM



GIVES YOU DATABASES, BULLETIN BOARDS, ELECTRONIC MAIL, PRESTEL — ALL ON YOUR COMMODORE 64 OR 128

At last! The perfect modem for your Commodore* 64 or 128, giving you access to Prestel*, Micronet*, viewdata and a host of other services — plus user-user communications.

It couldn't be simpler. The 64 Multimodem has autodial and autoanswer, with all comms software on-board in ROM. 64 Multimodem fits your Commodore's cartridge port, and has just one external connection — the telephone lead.

The 64 Multimodem is menu driven and multispeed, with CCITT V21/23 and Bell 103 standards, handling baud rates of 300/300, 1200/75 and 75/1200. Functions include save and print frame and automailbox with edit and save.

Buy your 64 Multimodem now and we'll give you free introductory subscriptions to Micronet and Microlink*: an unbeatable package at an unbeatable price — it's pure genius!

£98·50 (exc)

PROHIBITED from direct or indirect connection to public telecommunication systems. Action may be taken against anyone so connecting this apparatus.

Approval applied for

*reg'd trade marks of the companies concerned.

send to: Commodore Support, Miracle Technology (UK) Ltd., St Peters Street, Ipswich IP1 1XB.

please flash me ☐ **64 Multimodem/s**

@ £116.15 (inc VAT & UK delivery)

I enclose cheque/postal order/

please debit my Access/Visa

card no:..........................

Name..........................

Address..........................

....

Postcode..........................

VISA

From the Communications Powerhouse

MIRACLE TECHNOLOGY

MIRACLE TECHNOLOGY (UK) LTD ST PETERS STREET IPSWICH IP1 1XB ENGLAND
(0473) 216141 6 LINES TELECOM GOLD 79: KEY 001 (Dealerlink 72: DTB 10135)
946240 CWEASY G 19002985 PRESTEL MAILBOX 919992265

Teacher's Pet

As exam time draws near, Margaret Webb takes you through the latest in revision software.

SOON 'O' LEVEL AND CSE EXAM TIME will be with us again. Mock exams will have been taken and any areas needing extra work highlighted. Therefore it seems a good time to look at some of the software available and to discuss their various attributes. Several of the leading publishing/software houses have produced revision packs which are all very individual so I shall deal with each firm in turn by looking at what they are offering and how it is presented.

Commodore Software

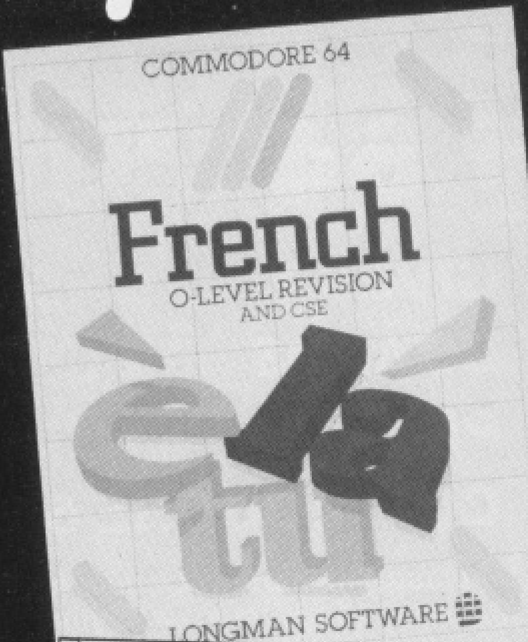
Commodore has a range of revision software which includes: English language (the only one I've seen); Geography – dealing with relief, climate, farming, industry etc; 'O' level French – general practice of tenses, verbs, pronouns etc; Computer Studies – logic, operational procedures, programming, data storage; Physics; Chemistry – basic techniques, reactions, periodic tables; Biology; Maths.

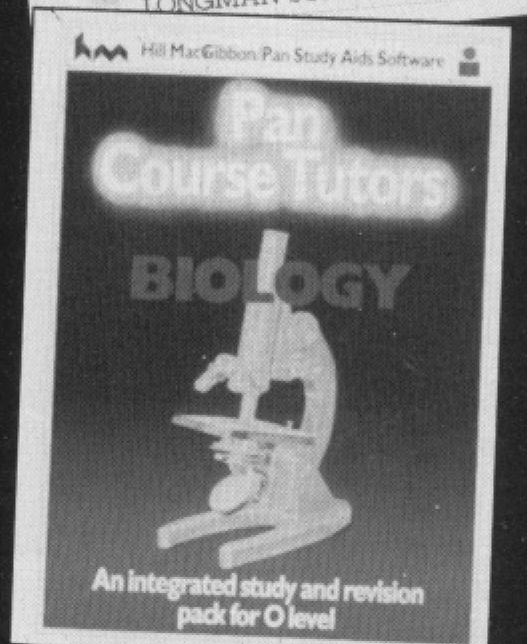
The maths package consists of two separate units. Maths 1 covers arithmetic, algebra, geometry, trigonometry, and problems. Maths 2 covers arithmetic, equations, progressions, functions, calculus and trigonometry. In both programs three types of question are used. These are true or false questions, multiple choice, in which there are up to four choices and a series of questions in which the answer must be typed in. A booklet accompanying the programs doubles as running instructions and revision notes.

All these retail at £9.99.

Penguin Study Software

Penguin has a long association with English literature study guides and these programs are a natural progression. They are purely revision aids and should be used in conjunction with the students own notes and a copy of the play being revised. The program takes the form of a database with excellent cross reference capabilities. If an essay is required on a given subject or image the program will search out all the references on that subject and list them, thus saving the user countless hours thumbing through the text. Titles in the range include Romeo and Juliet, The Merchant of Venice, Twelfth Night, Julius Caesar and Henry IV.





Longman's Exam Revision Software

Longmans is another publisher which has used its expertise in writing textbooks to good effect in the field of computer software. Each package contains a cassette and a 12 page booklet and revision planner.

Titles available are: French – a 2000 word vocabulary list, revision on regular and irregular verbs, comprehension practice and a section all about France, its regions and specialities; Biology – classification of animal and plant kingdoms, genetics and inheritance, food composition and a test of terms referring to the body; Computer Studies – how logic circuits work, file handling and useful Basic routines, Visicode low level languages; Mathematics – transformations, statistics, probability and odds, trigonometry; Physics – key formulae, light, machines and pulleys, circuits and Ohm's Law; Chemistry – the elements, molecular weight, preparation in the lab, Reactivity. All these packages cost £7.95.

Collins Gem Revision Software

These are packages costing £8.95 each which extend the Gem Basic Facts books with the addition of a cassette. Each cassette contains four different programs. The first is a random tester which helps determine any problem areas. The next two sections deal with helping the student to learn through a diagram with ordinary questions or multiple choice. The final section tests the student by means of a game against the computer. Four titles are available – Biology, Chemistry, Physics and Computer Studies.

Pan Course Tutors

At first glance the asking price of £14.95 a package seems a lot but on closer examination they represent a bargain not to be missed. They are the product of an amalgamation between book publishers, Heinemann and Pan, and software house Hill MacGibbon. A meaty combination especially when you add Collinsoft.

Each package consists of two cassettes, a student guide and a copy of the appropriate Pan Study Aid. These books have been around for many years and cover all essential parts of the syllabus. They explain how to tackle exam questions by giving examples and indicating which areas carry more marks. The books are very detailed and are labelled 'The complete guide to exam success'.

As if to contradict this the cassettes in this package are used in conjunction with the book. Cassette 1 has a series of diagnostic tests. From these you can assess your performance in one of three ways: A full analysis of your answers; a time analysis; a written report showing any weak areas and suggestions for further work.

Side two of tape one and both sides of tape two are detailed teaching programs designed to help the student as much as possible. Subjects covered are French, Maths, Physics, Chemistry and Biology.

By the time this article reaches you the long running teacher's pay dispute will hopefully be resolved. Should it not be so then the revision packages will hold even more importance. If it is sorted out, they are still a valuable resource and may make the difference between a pass or a Grade 1.

Save your fingers a lot of work with our new software service.

SOFTWARE FOR SALE

IT'S THREE O'CLOCK IN THE MORNING. You sit at the computer keyboard having just finished a marathon typing session entering one of the superb programs from Your Commodore. Your fingers reach for the keyboard and press the letters R, U and N/. You sit back expectantly and. . .nothing happens.

Well, I'm sure that we have all had problem before now. When it does happen it's a matter of spending hours searching through the program for any typing mistakes. No matter how long you look or how many people help you, you can usually guarantee that at least one little bug slips through unnoticed.

Here, at Your Commodore, we pride ourselves on the quality of listing that we print. Unfortunately, this usually means that they are also very long, thus taking longer to type in and leaving more room for errors. All of the listings in Your Commodore are taken straight from a printout of working programs, it is therefore very unusual for errors to appear in the magazine.

Because of the length of our programs we do get a large number of requests from readers who would like us to put specific programs on tape or disk for them. Obviously this is very time consuming and means that we can't spend as much time working on the magazine as we would like.

We are therefore proud to announce the start of the 'Your Commodore Software Service'. Most of the programs from each issue of the magazine will now be available on a single cassette for a price of just £4.00. We will not be making disks available since they would have to be a lot more expensive and more difficult to post. This shouldn't cause you any problems though as none of the programs will be protected and it will be a simple matter to save the programs to disk yourselves.

All programs on the cassette will be saved using a tape turbo routine. However, we cannot guarantee that all programs will work correctly with this turbo routine present. We therefore recommend that before you use any of the programs you make a copy of the programs on your own cassette or disk and use this version of the program **not** the original.

PLEASE COMPLETE IN BLOCK CAPITALS **ORDER FORM**

All cheques/postal orders should be made payable to:-
ARGUS SPECIALIST PUBLICATIONS LTD

I would like to order the following cassettes: (please tick box)

MARCH '86	YCMA861	£4.00	
UTILITY SPECIAL	YCMA862	£4.00	
APRIL '86	YCAPR86	£4.00	
MAY '86	YCMAR86	£4.00	

I enclose a cheque/postal order for £ . . . .

NAME. . . . .

ADDRESS. . . . .

. . . .

. . . .

POSTCODE. . . . .

All orders should be sent to:-
YOUR COMMODORE SOFTWARE, READERS SERVICES, ARGUS SPECIALIST PUBLICATIONS, WOLSEY HOUSE, WOLSEY ROAD, HEMEL HEMPSTEAD, HERTFORDSHIRE HP2 4SS.

Please allow at least 28 days for delivery.

OUT NOW SPECIAL 64K PLUS/4 VERSION

· AIR · COMBAT · EMULATOR ·

· BY CASCADE GAMES ·

1-3 Haywra Crescent Harrogate

£10.95
INC. FREE WATCH AND POSTAGE

THE FASTEST GAME ON TWO WINGS!
AND A FREE MULTIFUNCTION CALCULATOR WATCH



The AIR COMBAT EMULATOR, packed with exciting features, is by far the fastest, most realistic flight simulator available. For the first time on a home computer, feel what it is **really** like to fly a high performance military jet and engage tanks, missiles, ships, helicopter gun-ships and two types of cunning intelligent enemy aircraft.

Featuring over 300 sprite images, ACE has the smoothest, most detailed cockpit view of hills, trees and other ground objects ever achieved thanks to specially developed Dynamic Graphic Technique (D.G.T.©) allowing sensational high speed **solid** 3D graphics.

In combat, your head will spin as you struggle with the help of the advanced avionics which include a rear-view camera and radar, to stay alive long enough to do some damage to the enemy.

The unique two seat flying option (pilot, navigator/weapons man) and Synchro Speech© which passes vital aircraft condition information to the flight crew without freezing the action combined with dynamic tactical map, take offs and landings, summer, winter and night-time flying and a remarkably realistic in-flight refuelling option makes ACE the ultimate AIR COMBAT EMULATOR.

ACE SCENARIO

A vast invasion fleet has landed on your southern shores and discharged scores of tanks supported by helicopter gun-ships and protected by mobile surface to air missiles. Squadrons of enemy fighters give the enemy forces air cover. Advancing ruthlessly they are conquering your homeland, facing no opposition.

You are the last fighter pilot with only three A.C.E. Mark 2.1 multi role All Weather All Terrain AWAT© combat aircraft. Based at an allied airbase, your task is to attack and destroy the numerically superior enemy land and air forces and drive them from your shores. The final stage of the conflict, having already destroyed the enemy land forces and shot down their air force, is to sink the enemy fleet as it evacuates its defeated army.

ACE – EXPERIENCE IT NOW

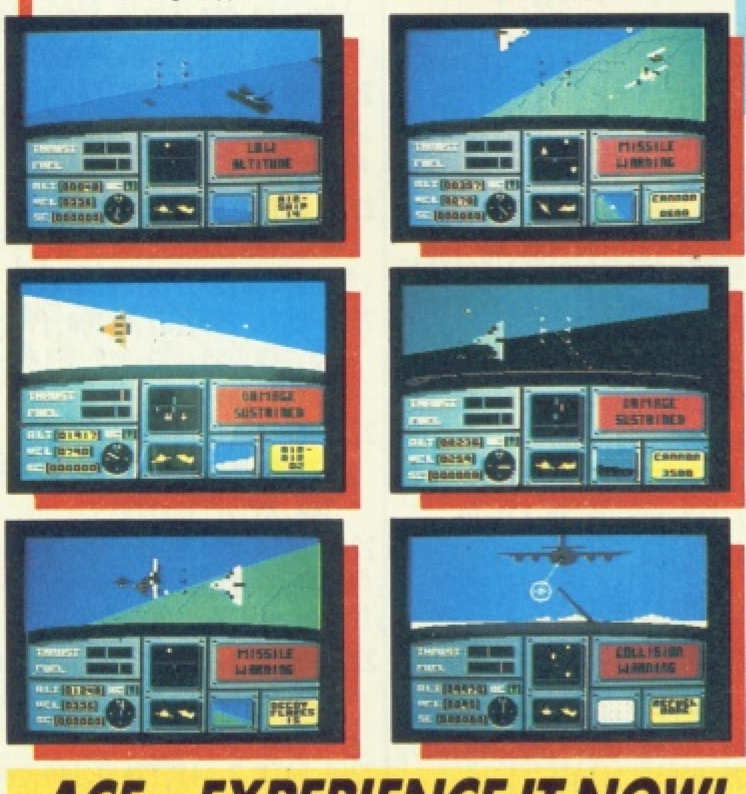
Every computer game fan will love ACE – just look at these features:-

- 100% optimized machine code uses all available memory.
- Featuring Dynamic Graphic Techniques (D.G.T.©)
- The smoothest, fastest and most detailed cockpit view of any flight simulation.
- Views of hills, trees, tanks and other ground objects. Aerial combat, ground attack and naval attack.
- Synchro Speech© ie. the speech does not freeze the action.
- Two seat option – fly and fight with the aid of a friend.
- Sensational 3D solid (not boring wireframed) graphics.
- High score saving system.
- AWAT© operation (All Weather All Terrain).

* Note due to memory limitations ACE on the C16 and VIC20 (+8K Ram) do not have any ground objects.

C= 64 DISK VERSION OUT NOW!!! £12.95 INC FREE WATCH

FREE 20 KEY MULTIFUNCTION CALCULATOR WATCH
• 12/24 Hour Time Mode • Alarm Mode • Calendar Mode • Calculator Mode



Screen shots are for CBM 64 version. Other versions may vary.

ACE – EXPERIENCE IT NOW!

FREE!!!

Order ACE today and receive this fantastic
20 KEY MULTIFUNCTION CALCULATOR WATCH
ABSOLUTELY FREE!!!

PRICE **£10.95 (DISK C= 64 £12.95 – C= 16 and VIC 20 £9.95)**

Postage FREE in U.K. Add £1 for overseas orders.
Allow 28 days for delivery.
I enclose cheque/postal order for (£..............................) made payable to Cascade Games Ltd.
Or through any Post Office by Transcash (Giro No. 655 6655).
For even faster ordering when charging to Access, Barclaycard and Trustcard Visa use our 24 hr service (Tel. 0423 504663).

ENTER CREDIT CARD NO. IN BOX:- ACCESS VISA

☐ C= 64 CASSETTE ☐ C= 64 DISK ☐ C= 16
☐ C= VIC 20 (with 8K RAM expansion) ☐ C= 128
☐ C= PLUS/4 (SPECIAL 64K PLUS/4 VERSION)

Please tick box

NAME ____________

ADDRESS ____________

POSTCODE ____________

COUNTRY ____________



Please complete and send to:-
Cascade Games Ltd.
1-3 Haywra Crescent
Harrogate HG1 5BG. England.
Tel. (0423) 504663
Registered No. 1755554

cascade

Allen Webb puts 3D graphics in focus.

TOP DRAW

TOP DRAW

UP TO NOW, I'VE TRIED TO give routines which will be of use to the widest possible range of readers. I now plan to give a few which will be of use mainly to game writers. The idea is to try to remove the problem of graphics from the user leaving him time to concentrate on the logic behind the game.

I've always been keen on 3D games so it's with this area that I wish to start. The use of 3D effects to depict movement down corridors or mazes is frequently used in arcade adventure type games. If you've seen Ariolasoft's Scarabaeus or Supersoft's Super Glooper, you'll know what I mean.

The idea behind the routine is that you define the maze as a two dimensional array in RAM. You call the routine specifying the co-ordinates of your position and the direction you're looking and the routine shows the view through the maze.

The maze is considered as an array of square cells. Each cell can have exits in any one of the four cardinal directions. If we assign a bit to each direction such that north uses bit zero, each uses bit one etc. we can calculate a number between zero and 15 which defines the cell. These are summarised in Table 1.

Table 1

Exits	Cell Value
None	0
N	1
E	2
N & E	3
S	4
N & S	5
E & S	6
N & E & S	7
W	8
N & W	9
E & W	10
N & E & W	11
S & W	12
N & S & W	13
E & S & W	14
all	15

Figure 1 shows the maze used in the demonstration listing. The only restriction is that all passages are limited to one cell wide.

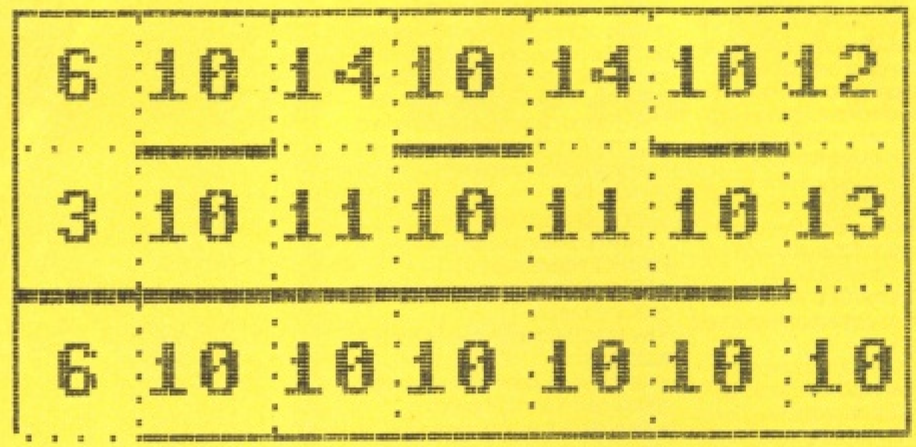
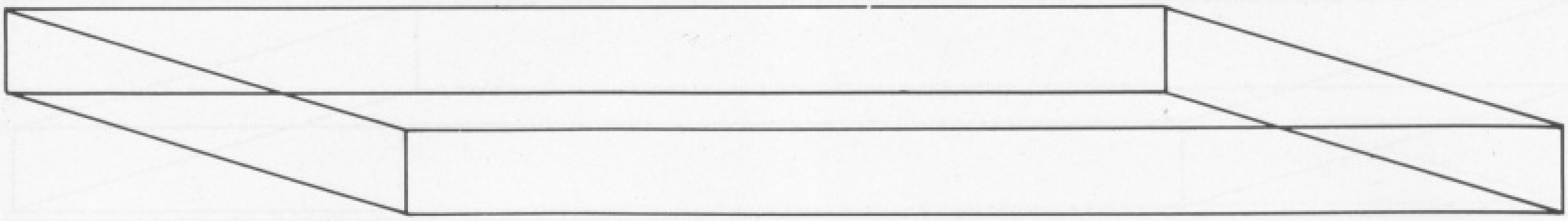


FIGURE 1 A SAMPLE MAZE

PROGRAM: 3D LOADER

```
10 REM******************************
   ***
20 REM* 3D MACHINE CODE LOADE
   R *
30 REM******************************
   ***
2000 FOR L=0 TO 145:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 38400+L*16+D
   A:NEXT D
2010 READ A:IF A<>CX THEN PRI
   NT"ERROR IN LINE";
   2040+(L*10):STOP
2020 NEXT L:END
2040 DATA 76,199,151,76,122,
   151,76,11,155,169,0,133,
   251,169,200,133,2072
2050 DATA 252,169,0,141,222,3
   141,223,3,173,224,3,141,
   114,155,32,1996
2060 DATA 155,151,238,223,3,
   173,223,3,201,20,240,20,24
   165,251,105,2195
2070 DATA 40,133,251,144,2,
   230,252,238,222,3,32,112,
   150,76,31,150,2066
2080 DATA 96,173,216,3,133,
   167,173,217,3,133,168,172,
   215,3,240,17,2129
2090 DATA 24,165,167,109,212,
   3,133,167,165,168,105,0,
   133,168,136,208,2063
2100 DATA 239,24,165,167,109,
   214,3,133,167,165,168,105,
   0,133,168,96,2056
2110 DATA 173,222,3,201,7,144,
   6,173,225,3,76,128,150,173,
   224,3,1911
2120 DATA 141,114,155,96,162,
   3,160,14,24,32,240,255,173,
   224,3,141,1937
2130 DATA 134,2,169,206,32,
   210,255,162,4,160,14,24,32,
   240,255,173,2072
2140 DATA 225,3,141,134,2,169,
   67,160,158,32,30,171,96,
   162,2,160,1712
2150 DATA 10,24,32,240,255,
   173,224,3,141,134,2,169,
   207,32,210,255,2111
2160 DATA 169,207,32,210,255,
   162,3,160,10,24,32,240,255,
   173,225,3,2160
2170 DATA 141,134,2,169,84,
   160,158,32,30,171,96,162,1,
   160,5,24,1529
2180 DATA 32,240,255,173,224,
   3,141,134,2,169,207,32,210,
   255,169,207,2453
2190 DATA 32,210,255,169,207,
   32,210,255,162,2,160,5,24,
   32,240,255,2250
2200 DATA 173,225,3,141,134,2,
   169,147,160,158,32,30,171,
   96,162,3,1806
2210 DATA 160,19,24,32,240,
   255,173,224,3,141,134,2,
   169,206,32,210,2024
2220 DATA 255,162,4,160,19,24,
   32,240,255,173,225,3,141,
   134,2,169,1998
2230 DATA 11,160,159,32,30,
   171,96,162,2,160,22,24,32,
   240,255,173,1729
2240 DATA 224,3,141,134,2,169,
   207,32,210,255,169,207,32,
   210,255,162,2412
2250 DATA 3,160,22,76,201,150,
   162,1,160,26,24,32,240,255,
   173,224,1909
2260 DATA 3,141,134,2,169,207,
   32,210,255,169,207,32,210,
```



The graphics use multicolour redefined characters. So that you have the maximum amount of RAM, a setup routine is used to shift the screen and characters to the area between the ROMs. The screen's new position is from 51200 to 52199. The views use the characters from Shifted A to Shifted S leaving you with a reasonable number for the creation of objects or monsters to put in the maze. You can specify the colour scheme by poking the following location:

Location 994 – Wall colour 1
Location 995 – Wall colour 2
Location 993 – Ceiling colour
Location 992 – Floor colour
Location 996 – Background
Location 997 – Border

The floor and ceiling colours force the multicolour mode and must therefore be in the range eight to 15 giving only eight colours.

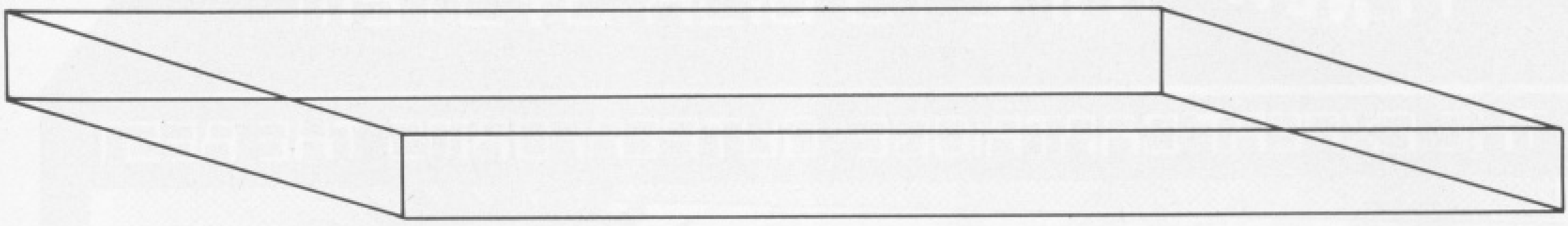
If you wish to use sprites, the sprite pointers are now located from 52216 to 52223. Useable sprites are numbers 48 to 64 and 128 to 254 and are located according to the equation:

Start Address = 52224+(Sprite Number-48)*64

The screen and character set limit the area available for sprites but there is plenty of room behind the kernal ROM.

```
255,169,207,2402
2270 DATA 32,210,255,162,2,
  160,26,76,252,150,173,22,
  208,9,16,141,1894
2280 DATA 22,208,173,226,3,
  141,34,208,173,227,3,141,
  35,208,173,228,2203
2290 DATA 3,141,33,208,173,
  229,3,141,32,208,96,174,
  222,3,189,115,1970
2300 DATA 155,133,253,189,135,
  155,133,254,160,0,24,165,
  252,105,16,133,2262
2310 DATA 171,165,251,133,170,
  177,253,56,233,128,145,251,
  173,114,155,145,2720
2320 DATA 170,200,192,34,208,
  239,96,32,14,152,165,20,
  141,216,3,165,2047
2330 DATA 21,141,217,3,32,14,
  152,165,20,141,212,3,32,14,
  152,165,1484
2340 DATA 20,141,230,3,32,14,
  152,165,20,141,231,3,32,14,
  152,165,1515
2350 DATA 20,201,2,208,3,76,
  24,152,201,4,208,3,76,184,
  152,201,1715
2360 DATA 3,208,3,76,88,153,
  201,1,208,3,76,248,153,96,
  32,253,1802
2370 DATA 174,32,138,173,32,
  247,183,96,32,9,150,173,
  230,3,141,214,2027
2380 DATA 3,173,231,3,141,215,
  3,32,65,150,165,167,141,82,
  3,165,1739
2390 DATA 168,141,83,3,160,0,
  177,167,41,2,208,3,76,58,
  155,238,1680
2400 DATA 214,3,32,65,150,160,
  0,177,167,141,232,3,41,1,
  240,3,1629
2410 DATA 32,219,150,173,232,
  3,41,4,240,3,32,86,151,173,
  232,3,1774
2420 DATA 41,2,208,3,76,152,
  154,238,214,3,32,65,150,
  160,0,177,1675
2430 DATA 167,141,232,3,41,1,
  240,3,32,173,150,173,232,3,
  41,4,1636
2440 DATA 240,3,32,55,151,173,
  232,3,41,2,208,3,76,211,
  154,238,1822
2450 DATA 214,3,32,65,150,160,
  0,177,167,141,232,3,41,1,
  240,3,1629
2460 DATA 32,132,150,173,232,
  3,41,4,240,3,32,14,151,173,
  232,3,1615
2470 DATA 41,2,208,3,76,11,
  155,96,32,9,150,173,230,3,
  141,214,1544
2480 DATA 3,173,231,3,141,215,
  3,32,65,150,165,167,141,82,
  3,165,1739
2490 DATA 168,141,83,3,160,0,
  177,167,41,8,208,3,76,58,
  155,206,1654
2500 DATA 214,3,32,65,150,160,
  0,177,167,141,232,3,41,4,
  240,3,1632
2510 DATA 32,219,150,173,232,
  3,41,1,240,3,32,86,151,173,
  232,3,1771
2520 DATA 41,8,208,3,76,152,
  154,206,214,3,32,65,150,
  160,0,177,1649
2530 DATA 167,141,232,3,41,4,
  240,3,32,173,150,173,232,3,
  41,1,1636
2540 DATA 240,3,32,55,151,173,
  232,3,41,8,208,3,76,211,
  154,206,1796
2550 DATA 214,3,32,65,150,160,
  0,177,167,141,232,3,41,4,
  240,3,1632
2560 DATA 32,132,150,173,232,
  3,41,1,240,3,32,14,151,173,
  232,3,1612
2570 DATA 41,8,208,3,76,11,
  155,96,32,9,150,173,230,3,
  141,214,1550
2580 DATA 3,173,231,3,141,215,
  3,32,65,150,165,167,141,82,
  3,165,1739
2590 DATA 168,141,83,3,160,0,
  177,167,41,4,208,3,76,58,
  155,238,1682
2600 DATA 215,3,32,65,150,160,
  0,177,167,141,232,3,41,2,
  240,3,1631
2610 DATA 32,219,150,173,232,
  3,41,8,240,3,32,86,151,173,
  232,3,1778
2620 DATA 41,4,208,3,76,152,
  154,238,215,3,32,65,150,
  160,0,177,1678
2630 DATA 167,141,232,3,41,2,
  240,3,32,173,150,173,232,3,
  41,8,1641
2640 DATA 240,3,32,55,151,173,
  232,3,41,4,208,3,76,211,
  154,238,1824
2650 DATA 215,3,32,65,150,160,
  0,177,167,141,232,3,41,2,
  240,3,1631
2660 DATA 32,132,150,173,232,
  3,41,8,240,3,32,14,151,173,
  232,3,1619
2670 DATA 41,4,208,3,76,11,
  155,96,32,9,150,173,230,3,
  141,214,1546
2680 DATA 3,173,231,3,141,215,
  3,32,65,150,165,167,141,82,
  3,165,1739
2690 DATA 168,141,83,3,160,0,
  177,167,41,1,208,3,76,58,
  155,206,1647
2700 DATA 215,3,32,65,150,160,
  0,177,167,141,232,3,41,8,
  240,3,1637
2710 DATA 32,219,150,173,232,
  3,41,2,240,3,32,86,151,173,
  232,3,1772
2720 DATA 41,1,208,3,76,152,
  154,206,215,3,32,65,150,
  160,0,177,1643
2730 DATA 167,141,232,3,41,8,
  240,3,32,173,150,173,232,3,
  41,2,1641
2740 DATA 240,3,32,55,151,173,
  232,3,41,1,208,3,76,211,
  154,206,1789
2750 DATA 215,3,32,65,150,160,
  0,177,167,141,232,3,41,8,
  240,3,1637
2760 DATA 32,132,150,173,232,
  3,41,2,240,3,32,14,151,173,
  232,3,1613
2770 DATA 41,1,208,3,76,11,
  155,96,162,16,160,13,169,
  89,133,251,1584
2780 DATA 169,200,133,252,32,
  74,155,173,224,3,141,134,2,
  169,181,160,2202
2790 DATA 154,32,30,171,96,19,
  17,17,29,29,29,29,29,29,29,
  29,768
2800 DATA 29,210,210,210,210,
  210,210,210,210,210,210,
```

```
     210,210,210,210,210,3179
2810 DATA 210,13,0,162,8,160,
     8,169,133,133,251,169,200,
     133,252,32,2033
2820 DATA 74,155,173,224,3,
     141,134,2,169,240,160,154,
     32,30,171,96,1958
2830 DATA 19,17,17,17,29,29,
     29,29,29,29,29,29,29,29,29,
     29,418
2840 DATA 29,210,210,210,210,
     210,210,210,210,13,0,162,2,
     160,4,169,2219
2850 DATA 176,133,251,169,200,
     133,252,32,74,155,173,224,
     3,141,134,2,2252
2860 DATA 96,19,17,17,17,17,
     17,29,29,29,29,29,29,29,29,
     29,461
2870 DATA 29,29,29,29,29,29,
     201,201,13,0,162,26,160,19,
     169,44,1169
2880 DATA 133,251,169,200,133,
     252,32,74,155,96,142,232,3,
     140,223,3,2238
2890 DATA 162,0,160,0,169,73,
     145,251,200,204,232,3,208,
     246,165,251,2469
2900 DATA 24,105,40,133,251,
     165,252,105,0,133,252,232,
     236,223,3,208,2362
2910 DATA 225,96,7,155,189,
     223,1,35,69,103,137,171,
     205,239,17,51,1923
2920 DATA 85,119,153,187,221,
     255,33,155,155,155,156,156,
     156,156,156,156,2454
2930 DATA 156,156,157,157,157,
     157,157,157,157,157,158,
     193,194,195,196,203,2707
2940 DATA 203,203,203,203,203,
     203,203,203,203,203,203,
     203,203,203,203,203,3248
2950 DATA 203,203,203,203,203,
     203,203,203,203,197,198,
     199,200,202,202,202,3227
2960 DATA 202,193,194,195,196,
     203,203,203,203,203,203,
     203,203,203,203,203,3213
2970 DATA 203,203,203,203,203,
     203,203,197,198,199,200,
     202,202,202,202,202,3225
2980 DATA 202,202,202,202,202,
     202,202,193,194,195,196,
     203,203,203,203,203,3207
2990 DATA 203,203,203,203,203,
     197,198,199,200,202,202,
     202,202,202,202,202,3223
3000 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,193,194,195,3208
3010 DATA 196,203,203,197,198,
     199,200,202,202,202,202,
     202,202,202,202,202,3214
3020 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3232
3030 DATA 202,202,202,208,211,
     202,202,202,202,202,202,
     202,202,202,202,202,3247
3040 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3232
3050 DATA 202,202,202,202,202,
     208,211,202,202,202,202,
     202,202,202,202,202,3247
3060 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3232
3070 DATA 202,202,202,202,202,
     202,202,208,211,202,202,
     202,202,202,202,202,3247
3080 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3232
3090 DATA 202,202,202,202,202,
     202,202,202,202,208,211,
     202,202,202,202,202,3247
3100 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3232
3110 DATA 202,202,202,202,202,
     202,202,202,202,202,204,
     203,203,205,202,202,3239
3120 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3232
3130 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     204,203,203,203,203,3238
3140 DATA 205,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3235
3150 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,204,203,203,203,3237
3160 DATA 203,203,203,205,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3238
3170 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,204,203,203,3236
3180 DATA 203,203,203,203,203,
     203,205,202,202,202,202,
     202,202,202,202,202,3241
3190 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,204,203,3235
3200 DATA 203,203,203,203,203,
     203,203,203,203,205,202,
     202,202,202,202,202,3244
3210 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,204,3234
3220 DATA 203,203,203,203,203,
     203,203,203,203,203,203,
     203,205,202,202,202,3247
3230 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3232
3240 DATA 204,203,203,203,203,
     203,203,203,203,203,203,
     203,203,203,203,205,3251
3250 DATA 202,202,202,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3232
3260 DATA 202,204,203,203,203,
     203,203,203,203,203,203,
     203,203,203,203,203,3248
3270 DATA 203,203,205,202,202,
     202,202,202,202,202,202,
     202,202,202,202,202,3237
3280 DATA 202,202,204,203,203,
     203,203,203,203,203,203,
     203,203,203,203,203,3247
3290 DATA 203,203,203,203,203,
     205,202,202,202,202,202,
     202,202,202,202,202,3240
3300 DATA 202,202,202,204,203,
     203,203,203,203,203,203,
     203,203,203,203,203,3246
3310 DATA 203,203,203,203,203,
     203,203,203,205,202,202,
     202,202,202,202,202,3243
3320 DATA 202,202,202,202,204,
     203,203,203,203,203,203,
     203,203,203,203,203,3245
3330 DATA 203,203,203,203,203,
     203,203,203,203,203,203,
     205,202,202,202,202,3246
3340 DATA 202,202,202,202,202,
     204,203,203,203,203,203,
     203,203,203,203,203,3244
3350 DATA 203,203,203,203,203,
     203,203,203,203,203,203,
     203,203,203,205,202,3249
3360 DATA 202,202,202,201,17,
     157,201,17,157,201,17,157,
     201,17,157,201,2307
3370 DATA 17,157,203,0,201,
     201,17,157,157,201,201,17,
     157,157,201,201,2245
3380 DATA 17,157,157,201,201,
     17,157,157,201,201,17,157,
     157,201,201,17,2216
3390 DATA 157,157,201,201,17,
     157,157,201,201,17,157,157,
     201,201,17,157,2356
3400 DATA 157,203,203,17,157,
     157,203,203,17,157,157,203,
     203,17,157,157,2368
3410 DATA 203,203,0,201,201,
     201,17,157,157,157,201,201,
     201,17,157,157,2431
3420 DATA 157,201,201,201,17,
     157,157,157,201,201,201,17,
     157,157,157,201,2540
3430 DATA 201,201,17,157,157,
     157,201,201,201,17,157,157,
     157,201,201,201,2584
3440 DATA 17,157,157,157,201,
     201,201,17,157,157,157,201,
     201,201,17,157,2356
3450 DATA 157,157,201,201,201,
     17,157,157,157,201,201,201,
     17,157,157,157,2496
3460 DATA 201,201,201,17,157,
     157,157,201,201,201,17,157,
     157,157,201,201,2584
3470 DATA 201,17,157,157,157,
     203,203,203,17,157,157,157,
     203,203,203,17,2412
3480 DATA 157,157,157,203,203,
     203,17,157,157,157,0,201,
     17,157,201,17,2161
3490 DATA 157,201,17,157,201,
     17,157,201,17,157,203,0,0,
     234,2,235,1956
```



The routines have two entry points:

SYS 38403 – initialises the colours and multicolour mode.
SYS 38400,SA,WI,XC,YC,DI
SA – Start address of the maze array
WI – The width of the maze (number of cells)
XC – Horizontal coordinate of the cell you are in
YC – Vertical coordinate of the cell you are in
DI – Direction of sight

1 = North
2 = East
3 = South
4 = West

In the demo, you may notice a number of points:

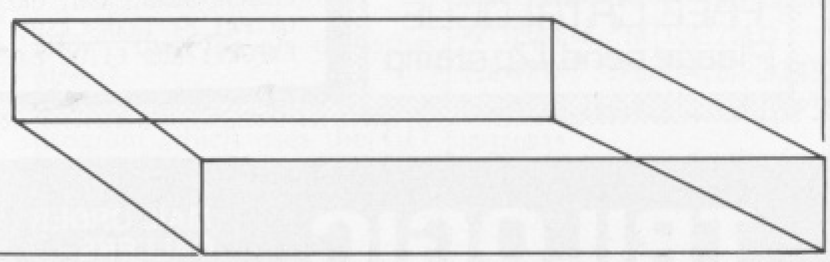
1) I use the normal screen memory to store the maze. This is handy if your maze is less than 1024 cells in size.
2) The routine does not handle your movement. The routine will show you a dead end but will not prevent you from moving through it. Lines 110-180 in the demonstration handle that.
3) After calling the routine, locations 850 and 851 hold the address of the cell you are in. By PEEKing this location, you can check which exits are open to movement. Line 60 and lines 150 to 180 in the demonstration show this.

PROGRAM: 3D SETUP

```
10 POKE 56,150:CLR
20 POKE 56578,PEEK(56578)OR 3: POKE 56576,
   (PEEK(56576)AND 252)OR 0
30 POKE 648,200
40 POKE 53272,(PEEK(53272)AND 240)OR 0
50 POKE 53272,(PEEK(53272)AND 15)OR 32
60 POKE 56334,PEEK(56334)AND 254
70 POKE 1,PEEK(1)AND 251
80 FOR I=0 TO 2047:POKE I+12*4096,PEEK(I+53248):NEXT
90 POKE 1,PEEK(1)OR 4
100 POKE 56334,PEEK(56334)OR 1
2000 FOR L=0 TO 9:CX=0:FOR D=0 TO 15:READ A:CX=CX+A
   :POKE 49672+L*16+D,A:NEXT D
2010 READ A:IF A<>CX THEN PRINT"ERROR IN LINE";2040+(L*10)
   :STOP
2020 NEXT L:PRINT CHR$(147)"NEW SCREEN POSITION AND CHARAC
   TER SET[SPC3]NOW SET UP"
2040 DATA 175,170,170,170,170,170,170,170,255,255,175,170,
   170,170,170,170,2900
2050 DATA 255,255,255,255,175,170,170,170,255,255,255,255,
   255,255,175,170,3580
2060 DATA 255,255,255,255,255,255,250,170,255,255,255,255,
   250,170,170,170,3730
2070 DATA 255,255,250,170,170,170,170,170,250,170,170,170,
   170,170,170,170,3050
2080 DATA 85,85,85,85,85,85,85,85,170,170,170,170,170,170,
   170,170,2040
2090 DATA 255,255,255,255,255,255,255,255,170,170,171,171,
   175,175,191,191,3454
2100 DATA 170,170,234,234,250,250,254,254,255,255,255,255,
   255,85,85,85,3346
2110 DATA 255,255,255,255,255,255,255,85,191,191,191,191,
   191,191,191,191,3398
2120 DATA 255,255,255,85,85,85,85,85,255,85,85,85,85,85,
   85,2040
2130 DATA 254,254,254,254,254,254,254,254,4,195,67,79,65,
   116,253,79,2890
2140 REM*************************
2150 REM* 3D SETUP ROUTINE[SPC3]*
2160 REM*************************
```

PROGRAM: 3D DEMO

```
10 DATA 6,10,14,10,14,10,12
20 DATA 3,10,11,10,11,10,13
30 DATA 6,10,10,10,10,10,9
40 FOR I=0 TO 20: READ X: POKE 1024+I,X:NEXT
50 POKE 992,11: POKE 993,9 : POKE 994,6 : POKE 995,14
   : POKE 996,0: POKE 997,0
60 DEF FNA(A)= PEEK(PEEK(851)*256+PEEK(850))
   : PRINT CHR$(147): POKE 650,128
70 SYS 38403
80 SYS 38400,1024,7,0,0,1:PRINT"[HOME]"TAB(36)"[WHITE,SPC]
   N[LEFT2,DOWN]W[UP-ARROW]E[DOWN,LEFT2]S"
90 XP=0:YP=0
100 GET I$:IF I$=""THEN 100
110 IF I$="E"THEN DI=2:PRINT"[HOME]"TAB(36)"[WHITE,SPC]E
   [DOWN,LEFT2]N[UP-ARROW]S[DOWN,LEFT2]W": FL=1: GOTO 190
120 IF I$="W"THEN DI=4:PRINT"[HOME]"TAB(36)"[WHITE,SPC]W
   [DOWN,LEFT2]S[UP-ARROW]N[DOWN,LEFT2]E": FL=1: GOTO 190
130 IF I$="S"THEN DI=3:PRINT"[HOME]"TAB(36)"[WHITE,SPC]S
   [DOWN,LEFT2]E[UP-ARROW]W[DOWN,LEFT2]N": FL=1: GOTO 190
140 IF I$="N"THEN DI=1:PRINT"[HOME]"TAB(36)"[WHITE,SPC]N
   [DOWN,LEFT2]W[UP-ARROW]E[DOWN,LEFT2]S": FL=1: GOTO 190
150 IF I$="F"AND DI=1 AND YP>0 AND (FNA(A) AND 1) THEN YP=
   YP-1: FL=1: GOTO 190
160 IF I$="F"AND DI=3 AND YP<2 AND (FNA(A) AND 4)THEN YP=Y
   P+1: FL=1: GOTO 190
170 IF I$="F"AND DI=2 AND XP<6 AND (FNA(A) AND 2) THEN XP=
   XP+1: FL=1: GOTO 190
180 IF I$="F"AND DI=4 AND XP>0 AND (FNA(A) AND 8) THEN XP=
   XP-1: FL=1
190 IF FL=1 THEN SYS 38400,1024,7,XP,YP,DI: FL=0
200 GOTO 100
210 REM***************
220 REM* 3D DEMO[SPC4]*
230 REM***************
```



Scratchpad

Eric Doyle has rustled up a few useful tips for you this month.

WE OFTEN GET LETTERS ASKing how two Basic programs can be merged together into a single program. This is useful for entering old and loved subroutines which can take hours to type in.

The problem with most simple merge routines is that they don't cater for the situation when the two programs share the same line numbers so I have included a routine which does a simple renumber.

Enter and save the listing and don't worry if you don't understand it, all will be revealed later.

The address of the start of Basic is stored in the two bytes starting at location 43 (hex 2B) and the end of a Basic program in the two bytes at location 45 (hex 2D). Normal loading of a program leaves the pointer at location 45 pointing at the last of the three zero bytes with which every Basic program ends. To merge a second program on to the one in memory we have to fool the computer into believing that the start of Basic is now at the end of that program.

This simply means that the pointer at location 43 is changed to the same value as the pointer in location 45. Unfortunately, that is not quite right because we have to lose the last two zero bytes from our program in memory first. In practice, we load pointer 43 with the value of pointer 45 minus two.

To get the actual value of the pointer the first byte is added to the second byte multiplied by 256:

```
P=PEEK (45) + PEEK (46) *256
```

Subtracting two from P:

```
P=P-2
```

And splitting the result into pointer 43:

```
POKE 43,P AND 255: POKE 44,P/256
```

We can now load our second program in the normal way after which we redirect pointer 43 to the normal beginning of Basic in this way:

```
POKE43,1:POKE44,8
```

Listing the program will now show that both programs have been joined together. Obviously, the above lines must be entered in direct mode just as they are written here and not given line numbers because that would really crash the system.

The programs cannot be said to be truly merged until the line numbers have been changed. The polite way to describe this dog's dinner of a program is to say that it is simply two concatenated programs. A renumber routine is needed.

Repeating the above procedure would allow a third renumbering program to be merged but to get it to run would be a nightmare. One solution is to fool the 64 into believing that Basic memory lies elsewhere in memory for the time being.

A likely place is the 'spare' block of memory which is much favoured by machine code programmers and starts at 49152. To alter the memory layout use the following line:

```
POKE44,192:POKE56,208:POKE 49152,0:NEW
```

Now load the renumber routine which you saved earlier using the normal LOAD syntax for your disk or tape.

Type RUN and press RETURN. When the program stops press RETURN again and, Hey Presto, there's your renumbered listing ready to be saved once you've changed all the GOTOs and GOSUBs (what do you expect, real magic?).

What happened is that the program followed all of the line links through the program in the normal Basic memory and changed the line numbers to the values selected in the renumber program.

Talking of magic. I bet I can make your screen wobble. Try this:

```
FOR A=0 to 200:POKE53270,A: NEXTA:POKE53270
```

How's that for an explosive effect?

If you've ever had a program which uses the GET command it may have occurred to you that it would be nice to have a flashing cursor to indicate that the computer is waiting for something to be input. Memory location 204 enables and disables the cursor, so write your GET statement like this:

```
10 POKE 204,0:GET A$:IF A$=""THEN10
20 PRINT A$
```

Well that's the last gem for this month. If you've written a handy little routine which you'd like to see on Commodores around the world, why not send them to Scratchpad, Your Commodore, No 1 Golden Square, London W1R 3AB.

```
ready.
are you sure?

10 INPUT "FIRST LINE NO";NL
20 INPUT "LINE INCREMENT";IN
C
30 NL=NL-INC
40 LK=2049:LN=2051
50 IFPEEK(LK)=0ANDPEEK(LK+1)
=0THEN 110
60 NL=NL+INC
70 POKELN,NL AND 255:POKELN+
1,NL/256
80 LK=PEEK(LK)+PEEK(LK+1)*25
6
90 LN=LK+2
100 GOTO50
110 PRINT"POKE45,"(LKAND255)
+2":POKE46,"INT(LK/256);
120 PRINT ":POKE44,8:POKE43,
1:POKE56,160:L[s I][UP][UP][
UP][UP]"
```

With Iain Murray's word processor, there's no need for shabby letters and scraggy documents.

WORD PROK

WORDPROK IS A DISK-BASED word processing package offering a full multi-function machine code screen editor and high-speed print out routine, along with a Basic main program equipped with a number of other facilities. It also allows you to "customise" it easily if required.

A word processor is a program which turns a computer into an "electronic typewriter". It allows you to enter text, correcting any mistakes as you go, and lets you add, delete, or change any sections as required before the final printout is produced. Thus the final draft is all that needs to be printed on paper, and it should be error-free, saving a lot of waste paper.

The listing comprises two programs: the first is a Basic loader program for the machine code section. This loads the machine code (in a series of DATA statements) into memory starting at 49152, and when the data is correct and loaded, the machine code section (just over 3K) is saved as a machine code file to disk. The main program can then load this program file, and the loader with the machine code data need only be used once, hence saving time when it is in use. The second program is the word processor itself, and provides easy access to the machine code routines used. Although the machine code would be difficult to modify, the Basic program could be adapted to suit your own requirements.

Wordprok Manual

On running the program, the machine code section is automatically loaded from disk if it is not already present in memory. A menu is then presented, with the following options.

1, EDIT DOCUMENT

This selection gives access to the machine code screen

```
 PROGRAM:  PROKCODE.GEN

10 REM *** WORDPROK CODE GEN
   ERATOR ***
20 REM *** BY IAIN MURRAY
    (C) 1986 ***
30 REM *** FOR YOUR COMMODOR
   E ***
50 POKE 53280,6:POKE 53281,1
60 PRINT "[CLEAR,DOWN3,
   RIGHT3,RVSON,SPC]WORDPROK
    MACHINE CODE GENERATOR
   [SPC,RVSOFF]"
65 PRINT"[DOWN3,RIGHT2]THIS
    WILL SAVE 'PROKCODE' ONT
   O DISK"
70 PRINT "[DOWN5,RIGHT7]
   LOADING DATA - PLEASE WAIT
100 AD=49152:C=0
110 READ A:POKE AD,A:C=C+A
   :AD=AD+1
120 IF AD<52441 THEN 110
130 IF A=96 AND C=507913 THE
   N 150
140 PRINT "[DOWN3,RIGHT7]
   ERROR IN DATA!!":END
150 PRINT "[DOWN3,RIGHT7]
   DATA OK-PRESS[SPC,RVSON,
   SPC]SPACE[SPC,RVSOFF,SPC]
   TO SAVE"
160 GET A$:IF A$<>" " THEN 1
   60
170 POKE 43,0:POKE 44,192
   :POKE 45,218:POKE 46,204
180 SAVE "PROKCODE",8
190 END
1000 DATA 169,80,133,251,169,
   4,133,252,173,254
1010 DATA 207,133,253,173,
   255,207,133,254,169,0
1020 DATA 141,232,207,141,
   252,207,141,253,207,160
1030 DATA 0,177,253,201,208,
   240,20,201,196,240
1040 DATA 16,201,211,240,12,
   201,202,240,8,201
1050 DATA 204,240,4,201,195,
   208,28,32,23,193
1060 DATA 177,253,145,251,32,
   154,192,32,191,192
1070 DATA 32,172,192,32,23,
   193,32,206,192,32
1080 DATA 9,193,76,31,192,
   201,102,208,20,145
1090 DATA 251,32,154,192,32,
   191,192,32,206,192
1100 DATA 32,30,193,32,23,
   193,76,103,192,201
1110 DATA 159,240,205,145,
   251,32,154,192,32,191
1120 DATA 192,32,172,192,173,
   238,207,240,16,173
1130 DATA 252,207,201,29,48,
   9,177,253,201,32
1140 DATA 208,3,32,23,193,32,
   206,192,32,9
1150 DATA 193,76,31,192,230,
   251,165,251,208,2
1160 DATA 230,252,96,230,253,
   165,253,208,2,230
1170 DATA 254,96,238,252,207,
   173,252,207,201,40
1180 DATA 48,8,238,253,207,
   169,0,141,252,207
1190 DATA 96,165,251,201,152,
   208,8,165,252,201
1200 DATA 7,208,2,104,104,96,
   173,232,207,208
1210 DATA 53,165,253,205,249,
   207,208,46,165,254
1220 DATA 205,250,207,208,39,
   174,253,207,232,232
1230 DATA 172,252,207,173,
   249,207,205,254,207,208
1240 DATA 12,173,250,207,205,
   255,207,208,4,162
1250 DATA 2,160,0,24,32,240,
   255,160,0,169
1260 DATA 1,141,232,207,96,
   165,253,24,105,1
1270 DATA 133,253,165,254,
   105,0,133,254,96,169
1280 DATA 32,145,251,32,154,
   192,165,251,201,152
1290 DATA 208,9,165,252,201,
   7,208,3,104,104
1300 DATA 96,32,172,192,173,
   252,207,201,0,240
1310 DATA 3,76,23,193,32,206,
   192,96,173,152
1320 DATA 219,201,6,240,50,
   173,224,217,205,239
1330 DATA 207,240,42,169,80,
   133,251,169,216,133
1340 DATA 252,173,239,207,
   145,251,165,251,24,105
1350 DATA 1,133,251,165,252,
   105,0,133,252,201
1360 DATA 219,208,234,165,
   251,201,152,208,228,173
1370 DATA 239,207,141,134,2,
   96,138,72,24,173
1380 DATA 250,207,105,177,
   176,17,56,169,224,237
1390 DATA 229,207,24,109,249,
   207,144,54,173,229
1400 DATA 207,240,49,56,173,
   249,207,237,229,207
1410 DATA 133,251,173,250,
   207,233,0,133,252,172
1420 DATA 229,207,177,251,
   160,0,145,251,201,102
1430 DATA 240,6,32,154,192,
   76,163,193,174,229
1440 DATA 207,32,37,199,202,
   208,250,169,0,141
1450 DATA 229,207,104,170,96,
   173,246,207,133,251
1460 DATA 173,247,207,133,
   252,160,0,177,251,172
1470 DATA 229,207,145,251,
   165,251,205,249,207,208
1480 DATA 42,165,252,205,250,
   207,208,35,172,229
1490 DATA 207,136,169,0,141,
   251,207,169,32,145
1500 DATA 251,173,251,207,
   240,8,104,104,169,0
1510 DATA 141,248,207,96,32,
   10,199,136,192,255
1520 DATA 208,231,96,198,251,
   165,251,201,255,208
1530 DATA 2,198,252,76,209,
   193,169,32,133,251
1540 DATA 169,78,133,252,160,
   0,140,244,207,140
1550 DATA 245,207,177,251,
   201,102,208,1,96,201
1560 DATA 194,240,6,32,154,
   192,76,40,194,32
```

```
1570 DATA 154,192,177,251,
   201,102,240,236,201,32
1580 DATA 240,243,201,197,
   240,228,238,244,207,173
1590 DATA 244,207,208,3,238,
   245,207,32,154,192
1600 DATA 177,251,201,102,
   240,208,201,197,240,204
1610 DATA 201,32,240,211,201,
   159,240,207,76,85
1620 DATA 194,76,73,197,169,
   0,141,248,207,141
1630 DATA 251,207,173,142,2,
   41,2,240,38,32
1640 DATA 228,255,240,236,
   201,137,208,6,238,33
1650 DATA 208,76,73,197,201,
   138,208,6,238,32
1660 DATA 208,76,73,197,201,
   139,240,3,76,39
1670 DATA 195,238,239,207,76,
   73,197,173,142,2
1680 DATA 41,4,208,3,76,31,
   195,32,228,255
1690 DATA 208,3,76,112,194,
   201,6,208,8,169
1700 DATA 1,141,248,207,133,
   204,96,201,30,208
1710 DATA 10,169,1,133,204,
   169,2,141,248,207
1720 DATA 96,201,31,208,15,
   172,138,2,173,237
1730 DATA 207,141,138,2,140,
   237,207,76,73,197
1740 DATA 201,28,208,10,169,
   4,141,248,207,169
1750 DATA 1,133,204,96,201,
   16,240,35,201,4
1760 DATA 240,31,201,19,240,
   27,201,2,240,23
1770 DATA 201,5,240,19,201,
   18,240,15,201,10
1780 DATA 240,11,201,12,240,
   7,201,3,240,3
1790 DATA 76,112,194,24,105,
   192,76,19,197,32
1800 DATA 228,255,208,3,76,
   112,194,201,166,208
1810 DATA 3,76,112,194,201,
   160,208,5,169,32
1820 DATA 76,19,197,201,192,
   208,5,169,64,76
1830 DATA 19,197,201,13,208,
   5,169,159,76,19
1840 DATA 197,201,141,208,5,
   169,159,76,19,197
1850 DATA 201,29,208,6,32,
   199,198,76,73,197
1860 DATA 201,157,208,6,32,
   233,198,76,73,197
1870 DATA 201,17,208,13,162,
   0,32,199,198,232
1880 DATA 224,40,208,248,76,
   73,197,201,145,208
1890 DATA 13,162,0,32,233,
   198,232,224,40,208
1900 DATA 248,76,73,197,201,
   147,208,16,172,238
1910 DATA 207,192,1,208,2,
   136,136,200,140,238
1920 DATA 207,76,73,197,201,
   19,208,15,173,254
1930 DATA 207,141,249,207,
   173,255,207,141,250,207
1940 DATA 76,73,197,201,20,
   208,14,169,1,141
1950 DATA 229,207,32,120,193,
   32,233,198,76,73
1960 DATA 197,201,148,208,11,
   169,1,141,229,207
1970 DATA 32,199,193,76,73,
   197,201,138,208,19
1980 DATA 169,40,141,229,207,
   32,120,193,173,229
1990 DATA 207,208,3,76,123,
   195,76,112,194,201
2000 DATA 139,208,11,169,40,
   141,229,207,32,199
2010 DATA 193,76,73,197,201,
   133,208,80,173,249
2020 DATA 207,133,251,173,
   250,207,133,252,162,0
2030 DATA 165,251,205,246,
   207,208,27,165,252,205
2040 DATA 247,207,208,20,169,
   0,141,251,207,32
2050 DATA 10,199,173,251,207,
   240,1,96,169,102
2060 DATA 160,1,145,251,169,
   32,160,0,145,251
2070 DATA 32,154,192,232,224,
   5,208,208,173,249
2080 DATA 207,24,105,5,141,
   249,207,173,250,207
2090 DATA 105,0,141,250,207,
   76,73,197,201,135
2100 DATA 208,31,162,0,160,0,
   32,233,198,173
2110 DATA 249,207,133,251,
   173,250,207,133,252,177
2120 DATA 251,201,32,240,5,
   232,224,80,208,232
2130 DATA 76,73,197,201,136,
   208,31,162,0,160
2140 DATA 0,32,199,198,173,
   249,207,133,251,173
2150 DATA 250,207,133,252,
   177,251,201,32,240,5
2160 DATA 232,224,80,208,232,
   76,73,197,201,137
2170 DATA 208,16,162,0,160,3,
   32,233,198,232
2180 DATA 208,250,136,208,
   247,76,73,197,201,140
2190 DATA 208,16,162,0,160,3,
   32,199,198,232
2200 DATA 208,250,136,208,
   247,76,73,197,201,134
2210 DATA 208,47,162,20,169,
   1,141,229,207,32
2220 DATA 120,193,32,233,198,
   173,249,207,133,253
2230 DATA 173,250,207,133,
   254,198,253,165,253,201
2240 DATA 255,208,2,198,254,
   160,0,177,253,201
2250 DATA 32,240,3,202,208,
   214,76,179,195,141
2260 DATA 231,207,24,105,192,
   144,29,173,231,207
2270 DATA 24,105,63,176,12,
   173,231,207,56,233
2280 DATA 64,141,231,207,76,
   16,197,173,231,207
2290 DATA 56,233,128,141,231,
   207,173,231,207,72
2300 DATA 173,249,207,133,
   251,173,250,207,133,252
2310 DATA 160,0,104,145,251,
   173,246,207,205,249
2320 DATA 207,208,27,173,247,
   207,205,250,207,208
2330 DATA 19,200,169,102,145,
   251,169,0,141,251
2340 DATA 207,32,10,199,173,
   251,207,240,1,96
2350 DATA 32,199,198,169,1,
   141,228,207,32,233
2360 DATA 198,32,0,192,32,
   199,198,32,62,193
2370 DATA 173,232,207,208,
   120,173,250,207,205,255
2380 DATA 207,240,5,16,28,76,
   118,197,173,249
2390 DATA 207,205,254,207,
   240,17,16,15,173,249
2400 DATA 207,141,254,207,
   173,250,207,141,255,207
2410 DATA 76,78,197,173,250,
   207,197,254,240,5
2420 DATA 48,3,76,154,197,
   173,249,207,197,253
2430 DATA 240,63,48,61,173,
   249,207,201,32,208
2440 DATA 7,173,250,207,201,
   78,240,47,173,249
2450 DATA 207,56,233,12,141,
   254,207,173,250,207
2460 DATA 233,0,141,255,207,
   201,78,208,23,173
```

▶

editor, turning the computer into a typewrite on the screen. All the standard upper and lower case letters are available, as well as the graphics characters accessed via the Commodore logo key.

Text will appear at the flashing cursor as in the normal screen editor. A small check square character (▪) indicates the end of the text. To exit from the editor, hold CTRL and Press "←". On re-entering the editor from the main menu, the cursor will be in the position it was in when the exit was made. To display the help facility, hold CTRL and press "↑". These messages are also displayed at the foot of the screen throughout editing. The help facility gives an on-screen summary of the screen editor functions and control characters. These are as follows:

CTRL ←: Return to main menu.
CTRL ↑: Print on-screen help messages. These are printed on the screen one page at a time, then control is returned to the editor.
CTRL £: Enter serach/replace mode. This allows you to search for specific text in the file, and replace it if required. The search string is requested (along with a replace string if required). Both strings must contain at least two characters, and not more than 40 characters. The search routine then finds the next occurrence of the search string in the text starting from the current cursor position, and displays this. Pressing SPACE will find the next occurrence of the search string. Pressing R (if replace was selected) will replace the word found with the replace word, and find the next occurrence of the search string. Pressing RETURN will return control to the editor.
CTRL =: Automatic key repeat on£off toggle. This allows all keys to auto-repeat or not.
CRSR Right: Move cursor to next character.
CRSR Left: Move cursor to previous character.
CRSR Up: Move cursor back 40 characters.
CRSR Down: Move cursor forward 40 characters.
CLR: Split/unsplit words. Normally, words are split at the end of a line as the line "wrapsround". Pressing CLR will autoatically throw a line feed before the end of the line, so allowing

the text to be read more easily.
HOME: The cursor is moved to the top left corner of the screen.
F1: Tab. Five spaces are printed from the current cursor position.
F3: Delete word. Text is deleted from the current cursor position back to the first preceding space.
F5: Cursor back one word. The cursor is moved left to the first preceding space.
F7: Cursor forward one word. The cursor is moved right to the first space.
F2: Cursor up one page. The cursor is moved back 256 characters.
F4: Delete line. The 40 characters preceding the cursor are deleted.
F6: Insert line. 40 spaces are inserted at the current cursor position.
F8: Cursor down one page. The cursor is moved forward 256 characters.
CBM F1: Change background colour.
CBM F3: Change border colour.
CBM F5: Change text colour.

In addition to these control function keys, several keys add special characters into the text in reverse field. These are used to control formatting during printing and are as follows:
←: RETURN character. Jumps to next line (line throw).
CTRL P: Page throw. When printing out, a new page is started.
CTRL D: Double line spacing. A line is thrown, and subsequent lines are double spaced i.e. one blank line appears between each line of text. This is the default spacing.
CTRL S: Single line spacing. A line is thrown, and subsequent lines are single spaced i.e. no space between lines of text.
CTRL L: Left justify text. A line is thrown, and subsequent text is printed left justified i.e. the left margin is aligned, but the right margin is ragged. This is similar to the output from a normal typewriter.
CTRL R: Right justify text. A line is thrown, and subsequent text is printed right justified i.e. the right margin is aligned, but the left margin is ragged.
CTRL J: Right and left justify. A line is thrown, and subsequent lines are printed right and left justified i.e. both margins are aligned. This is the default justification setting.

```
2470 DATA 254,207,201,31,16,
   16,169,32,141,254
2480 DATA 207,141,249,207,
   169,78,141,255,207,141
2490 DATA 250,207,76,78,197,
   173,228,207,208,1
2500 DATA 96,76,112,194,169,
   1,133,204,169,65
2510 DATA 133,251,169,3,133,
   252,173,249,207,133
2520 DATA 253,173,250,207,
   133,254,160,0,177,253
2530 DATA 201,102,240,13,162,
   0,32,163,192,160
2540 DATA 0,177,253,201,102,
   208,6,169,1,141
2550 DATA 241,207,96,72,138,
   168,104,209,251,208
2560 DATA 229,232,236,64,3,
   208,225,165,253,141
2570 DATA 249,207,165,254,
   141,250,207,202,32,233
2580 DATA 198,202,208,250,
   169,0,141,228,207,32
2590 DATA 78,197,169,0,133,
   204,32,228,255,201
2600 DATA 13,208,10,169,0,
   141,241,207,169,1
2610 DATA 133,204,96,201,32,
   208,3,76,224,197
2620 DATA 72,173,240,207,208,
   4,104,76,60,198
2630 DATA 104,201,82,208,217,
   169,1,133,204,173
2640 DATA 106,3,201,2,240,17,
   201,1,240,19
2650 DATA 56,173,107,3,237,
   64,3,141,229,207
2660 DATA 32,199,193,32,168,
   198,76,224,197,32
2670 DATA 168,198,56,173,64,
   3,170,237,107,3
2680 DATA 141,229,207,32,199,
   198,202,208,250,32
2690 DATA 120,193,174,64,3,
   32,233,198,202,208
2700 DATA 250,76,224,197,173,
   249,207,133,253,173
2710 DATA 250,207,133,254,
   169,108,133,251,169,3
2720 DATA 133,252,160,0,177,
   251,145,253,200,204
2730 DATA 107,3,208,246,96,
   152,72,160,0,173
2740 DATA 249,207,133,251,
   173,250,207,133,252,177
2750 DATA 251,201,102,240,11,
   238,249,207,173,249
2760 DATA 207,208,3,238,250,
   207,104,168,96,152
2770 DATA 72,24,173,250,207,
   105,177,176,7,173
2780 DATA 249,207,105,224,
   144,13,206,249,207,173
2790 DATA 249,207,201,255,
   208,3,206,250,207,104
2800 DATA 168,96,173,247,207,
   201,159,208,8,169
2810 DATA 1,141,251,207,76,
   36,199,238,246,207
2820 DATA 173,246,207,208,3,
   238,247,207,96,206
2830 DATA 246,207,173,246,
   207,201,255,208,3,206
2840 DATA 247,207,96,169,8,
   170,160,255,32,186
2850 DATA 255,173,64,3,160,3,
   162,65,32,189
2860 DATA 255,32,166,199,165,
   251,133,253,165,252
2870 DATA 133,254,32,208,199,
   169,253,166,251,164
2880 DATA 252,32,216,255,96,
   169,8,170,160,0
2890 DATA 32,186,255,173,64,
   3,160,3,162,65
2900 DATA 32,189,255,169,0,
   174,249,207,172,250
2910 DATA 207,32,213,255,169,
   32,141,254,207,141
2920 DATA 249,207,169,78,141,
   250,207,141,255,207
2930 DATA 169,32,133,251,169,
   78,133,252,32,208
2940 DATA 199,165,251,141,
   246,207,165,252,141,247
2950 DATA 207,169,102,160,0,
   145,251,96,169,32
2960 DATA 133,251,169,78,133,
   252,169,0,141,230
2970 DATA 207,168,177,251,
   201,194,240,21,201,197
2980 DATA 240,10,201,102,240,
   6,32,154,192,76
2990 DATA 180,199,169,1,141,
   230,207,104,104,96
3000 DATA 160,0,152,141,230,
   207,177,251,201,197
3010 DATA 240,13,201,102,208,
   3,76,233,199,32
3020 DATA 154,192,76,214,199,
   32,154,192,96,169
3030 DATA 48,133,252,169,2,
   133,253,169,0,133
3040 DATA 144,169,36,133,251,
   169,251,133,187,169
3050 DATA 0,133,188,165,253,
   133,183,169,8,133
3060 DATA 186,169,96,133,185,
   32,213,243,165,186
3070 DATA 32,180,255,165,185,
   32,150,255,164,144
3080 DATA 208,68,160,6,132,
   251,32,165,255,166
3090 DATA 252,133,252,164,
   144,208,53,164,251,136
3100 DATA 208,238,164,252,32,
   205,189,169,32,32
3110 DATA 210,255,32,165,255,
   72,173,142,2,208
3120 DATA 251,104,166,144,
   208,24,170,240,6,32
3130 DATA 210,255,76,64,200,
   169,13,32,210,255
3140 DATA 165,197,201,63,240,
   4,160,4,208,190
3150 DATA 32,66,246,96,165,
   251,141,226,207,165
3160 DATA 252,141,227,207,
   173,196,207,240,28,169
3170 DATA 200,141,38,3,169,
   204,141,39,3,169
3180 DATA 127,141,13,221,169,
   255,141,3,221,169
3190 DATA 0,141,1,221,76,171,
   200,169,4,170
3200 DATA 160,7,32,186,255,
   169,0,32,189,255
3210 DATA 32,192,255,32,156,
   204,32,151,204,169
3220 DATA 0,141,197,207,170,
   189,215,207,157,219
3230 DATA 207,232,224,4,208,
   245,32,166,199,169
3240 DATA 1,141,208,207,141,
   211,207,173,225,207
3250 DATA 240,6,32,39,204,76,
   219,200,32,39
3260 DATA 204,32,23,204,32,
   23,204,169,0,141
3270 DATA 225,207,141,199,
   207,141,203,207,141,205
3280 DATA 207,162,0,142,206,
   207,142,202,207,160
3290 DATA 0,177,251,141,207,
   207,32,154,192,173
3300 DATA 207,207,201,159,
   208,3,76,147,201,201
3310 DATA 102,208,3,76,147,
   201,201,197,208,3
3320 DATA 76,147,201,24,105,
   64,144,34,173,207
3330 DATA 207,201,208,240,
   116,201,202,240,112,201
3340 DATA 210,240,108,201,
   204,240,104,201,195,240
3350 DATA 100,201,211,240,96,
```

```
   201,196,240,92,76
3360 DATA 241,200,173,207,
   207,24,105,224,176,12
3370 DATA 173,207,207,24,105,
   64,141,207,207,76
3380 DATA 127,201,173,207,
   207,201,64,208,8,169
3390 DATA 96,141,207,207,76,
   127,201,24,105,192
3400 DATA 144,29,173,207,207,
   24,105,160,144,12
3410 DATA 173,207,207,24,105,
   64,141,207,207,76
3420 DATA 127,201,173,207,
   207,24,105,128,141,207
3430 DATA 207,173,207,207,
   157,192,206,232,169,32
3440 DATA 157,192,206,236,
   210,207,240,11,76,241
3450 DATA 200,169,1,141,202,
   207,76,180,201,177
3460 DATA 251,201,32,240,19,
   198,251,165,251,201
3470 DATA 255,208,2,198,252,
   202,240,74,177,251
3480 DATA 201,32,208,237,138,
   208,3,76,237,202
3490 DATA 142,206,207,173,
   192,206,201,32,208,36
3500 DATA 173,193,206,201,32,
   208,7,173,194,206
3510 DATA 201,32,240,22,162,
   1,206,206,207,189
3520 DATA 192,206,202,157,
   192,206,236,206,207,240
3530 DATA 209,232,232,76,215,
   201,174,206,207,189
3540 DATA 192,206,201,32,208,
   6,206,206,207,76
3550 DATA 232,201,162,0,238,
   206,207,173,202,207
3560 DATA 240,22,173,206,207,
   208,3,76,237,202
3570 DATA 173,208,207,201,2,
   240,7,201,3,240
3580 DATA 3,76,167,202,173,
   208,207,208,3,76
3590 DATA 167,202,201,1,208,
   104,162,0,189,192
3600 DATA 206,201,32,208,9,
   232,236,206,207,208
3610 DATA 243,76,167,202,142,
   200,207,76,67,202
3620 DATA 189,192,206,201,32,
   240,9,232,236,206
3630 DATA 207,208,243,76,167,
   202,174,206,207,189
3640 DATA 192,206,201,32,240,
   12,202,236,200,207
3650 DATA 208,243,206,206,
   207,76,76,202,202,142
3660 DATA 201,207,174,206,
   207,189,192,206,232,157
3670 DATA 192,206,202,202,
   236,201,207,208,242,173
3680 DATA 206,207,205,210,
   207,208,3,76,167,202
3690 DATA 238,206,207,174,
   201,207,202,76,79,202
3700 DATA 173,210,207,56,237,
   206,207,72,173,208
3710 DATA 207,201,2,240,3,
   104,74,72,104,24
3720 DATA 109,209,207,170,76,
   170,202,174,209,207
3730 DATA 169,32,32,210,255,
   202,208,248,173,196
3740 DATA 207,240,42,189,192,
   206,24,105,191,144
3750 DATA 34,189,192,206,24,
   105,165,144,17,189
3760 DATA 192,206,24,105,159,
   144,18,189,192,206
3770 DATA 56,233,128,76,228,
   202,189,192,206,24
3780 DATA 105,32,76,228,202,
   189,192,206,32,210
3790 DATA 255,232,236,206,
   207,208,197,32,23,204
3800 DATA 238,205,207,173,
   205,207,205,212,207,208
3810 DATA 3,76,174,203,173,
   211,207,240,17,32
3820 DATA 23,204,238,205,207,
   173,205,207,205,212
3830 DATA 207,208,3,76,174,
   203,173,202,207,208
3840 DATA 20,173,142,2,41,1,
   240,10,32,171
3850 DATA 204,201,32,240,3,
   76,223,203,76,233
3860 DATA 200,173,207,207,
   201,159,240,229,201,196
3870 DATA 208,8,169,1,141,
   211,207,76,166,203
3880 DATA 201,211,208,8,169,
   0,141,211,207,76
3890 DATA 166,203,201,195,
   208,8,169,3,141,208
3900 DATA 207,76,166,203,201,
   204,208,8,169,0
3910 DATA 141,208,207,76,166,
   203,201,210,208,8
3920 DATA 169,2,141,208,207,
   76,166,203,201,202
3930 DATA 208,8,169,1,141,
   208,207,76,166,203
3940 DATA 201,208,208,22,169,
   1,141,199,207,173
3950 DATA 205,207,205,212,
   207,240,25,32,23,204
3960 DATA 238,205,207,76,133,
   203,201,197,208,8
3970 DATA 169,1,141,203,207,
   76,128,203,201,102
3980 DATA 240,244,173,199,
   207,208,3,76,25,203
3990 DATA 32,23,204,32,23,
   204,32,49,204,32
4000 DATA 23,204,32,23,204,
   173,203,207,240,61
4010 DATA 206,214,207,173,
   214,207,240,21,162,0
4020 DATA 189,219,207,157,
   215,207,232,224,4,208
4030 DATA 245,169,1,141,225,
   207,76,188,200,173
4040 DATA 196,207,240,13,169,
   202,141,38,3,169
4050 DATA 241,141,39,3,76,
   244,203,32,231,255
4060 DATA 173,226,207,133,
   251,173,227,207,133,252
4070 DATA 96,173,213,207,240,
   10,32,171,204,201
4080 DATA 32,240,3,76,223,
   203,32,23,204,32
4090 DATA 23,204,76,210,200,
   169,13,32,210,255
4100 DATA 173,196,207,240,5,
   169,10,32,210,255
4110 DATA 96,173,223,207,201,
   1,208,95,76,56
4120 DATA 204,173,223,207,
   201,2,208,85,174,224
4130 DATA 207,169,32,32,210,
   255,202,208,248,169
4140 DATA 45,32,210,255,169,
   32,32,210,255,162
4150 DATA 3,189,215,207,201,
   48,208,3,202,208
4160 DATA 246,189,215,207,32,
   210,255,202,208,247
4170 DATA 238,216,207,173,
   216,207,201,58,208,23
4180 DATA 169,48,141,216,207,
   238,217,207,173,217
4190 DATA 207,201,58,208,8,
   169,48,141,217,207
4200 DATA 238,218,207,169,32,
   32,210,255,169,45
4210 DATA 32,210,255,32,23,
   204,96,32,23,204
4220 DATA 76,223,203,162,4,
   32,201,255,32,183
4230 DATA 255,41,128,240,7,
   169,5,141,197,207
```

▶

CTRL C: Centralise text on line. A line is thrown, and subsequent lines are printed with the text centralised on the line. This would normally be used to print headings etc.

CTRL B: Beginning marker. This sets the beginning of the block for saving, printing and word counting. More than one begin marker may be used, but only the first will be recognised.

CTRL E: End marker. This sets the end of the block for saving, printing, and word counting. More than one end marker may be used, but only the first will be recognised. If no end marker is used, the action will continue until the end of the text marker (⁙) is reached.

2. SAVE DOCUMENT

This option allows you to save any or all of the text currently in the memory to disk. The text saved is from the first beginning marker (B) to the first end marker (E or ⁙), and the save routine gives an exit option if these markers have not been set up. A filename is then requested, which can be up to 12 characters long. Wild card filenames (i.e. those containing the characters *, ? or .) are not acceptable. On saving, the suffix .TXT is added to the disk file name to assist in identification of text files. If the markers are incorrectly set, if the disk drive is not available, or if the file exists, an error message is printed, otherwise a successful save message is displayed, and pressing SPACE causes a return to the main menu.

3. LOAD DOCUMENT

This option allows you to load a text file from disk into memory for editing or printing. Loading will start from the current cursor position, and an exit option is given if this has not been set up. A filename is then requested, which can be up to 12 characters long. Wild card filenames are not acceptable. The routine will then search for a file of this name with the suffix .TXT, and if a load error occurs, an error message is displayed, otherwise a successful load message is displayed and pressing SPACE causes a return to the main menu. As loading commences from the cursor position, several files may be chained into one in memory. When loading is complete, the cursor is set to the start of the text memory.

4. PRINT DOCUMENT

This option allows you to print the current document in memory to a printer (device #4). The text is printed from the first beginning marker (B) to the first end marker (E or ⁙). The text is automatically formatted and line spaced as required during printing, with page throws generated when a page is filled. Formatting and page feed instructions are contained in control characters within the text (see editor functions above), and other information about the printout format is requested before the document is printed. The prompts given are as follows:

Left and right margins: The normal printer width of 80 characters is assumed, but by selecting margins, borders for binding the document, etc. can be set up, as well as moving the text column across the page as required.

Page hold: This allows a pause for convenience, or to insert a new sheet of paper in a friction-feed printer after the printing of each page is completed. Pressing SPACE will continue the print, and pressing F7 will terminate the print.

Page numbers: Pages can be un-numbered, numbered at the top, or numbered at the bottom, and the type required is selected from the menu. If numbers are required, the number of the first page is requested, and this should be in the range 0-900.

Page length: The number of lines per page will vary depending on the size of paper used. The number given is the full paper length, though a margin of five blank lines is left at the top and bottom of each page. If page numbering is selected, the numbers are printed in the middle of the required margin, and centralised with respect to the text.

Number of copies: Up to nine copies of the document can be printed at one time, and the number required is requested. When all the prompts have been answered, the printer should be turned on and the paper set up correctly (the program prints a demonstration sketch for a tractor-feed printer such as the 1525). Pressing SPACE will allow printing to commence. Holding down the SHIFT or SHIFT LOCK keys during

```
4240 DATA 104,104,96,169,0,
   141,33,208,32,228
4250 DATA 255,201,32,240,9,
   201,136,208,245,169
4260 DATA 2,141,32,208,72,
   169,1,141,33,208
4270 DATA 104,96,32,202,241,
   72,169,16,44,13
4280 DATA 221,240,251,104,
   141,1,221,24,96
4290 REM *** END OF DATA ***
```

PROGRAM: WORDPROK+

```
10 REM *** WORDPROK-WORD PRO
   CESSOR ***
20 REM *** BY IAIN MURRAY
    (C) 1986 ***
30 REM *** FOR "YOUR COMMODO
   RE"[SPC4]***
35 REM *** WORD PROCESSOR
    WITH[SPC5]***
36 REM *** SCREEN EDITOR,
    AND[SPC6]***
37 REM *** PRINTOUT TO COMMO
   DORE[SPC3]***
38 REM *** OR CENTRONICS PRI
   NTER[SPC3]***
40 POKE 53280,6:POKE 53281,1
   :REM * SCREEN COLOURS
42 IF PEEK(49152)=169 THEN 70
45 PRINT CHR$(142);"[CLEAR,
   BLACK,DOWN3,RIGHT15,RVSON,
   SPC]WORDPROK[SPC,RVSOFF]"
50 PRINT "[DOWN4,RIGHT6]
   LOADING MACHINE CODE SECT
   ION"
55 PRINT "[DOWN3,RIGHT13,
   RVSON,SPC]PLEASE[SPC2]
   WAIT[SPC,RVSOFF]"
60 LOAD "PROKCODE",8,1
70 POKE 56,78:REM * MEMORY
    TOP
90 PRINT "[CLEAR]"
100 SF=49152:CL=49470
   :REM * SCREEN FILL AND
    COLOUR FILL ROUTINES
110 DE=49528:IN=49607
   :REM * DELETE AND INSERT
    ROUTINES
120 WC=49688:CG=49773
   :REM * WORD COUNT AND CHA
   RACTER PROCESSING
124 SV=50995:LD=51037
   :REM * SAVE AND LOAD
125 FB=51110:FE=51152
   :REM * FIND BEGIN AND END
    MARKERS
126 ZR=50656:REM * SEARCH/RE
   PLACE ROUTINE
127 DR=51181:REM * DISK DIRE
   CTORY
128 PO=51306:REM * PRINT ROU
   TINE
130 SS=20000:CP=SS:TP=SS
   :VW=53230:DV=3
140 POKE 53231,0:POKE 53248,6
   :POKE 53249,1:REM * SCRN
    & TEXT CLRS
145 POKE VW,0:POKE 53217,1
147 POKE 650,0:POKE 53229,255
150 NO$="1234567890123456789
   01234567890123456789O"
160 ET$="[CLEAR,DOWN,RIGHT13,
   RVSON,SE]DITOR[SPC,SF]
   UNCTIONS[RVSOFF,DOWN]
   "+CHR$(13)
170 X1$="[DOWN2,RIGHT2]1)
   [SPC,SI]MMEDIATE[SPC,SC]
   OMMANDS"+CHR$(13)
180 X2$="[RIGHT4]2)[SPC,SC]
   ONTROL[SPC,SC]HARACTERS
   [SPC,SW]ITHIN[SPC,ST]
   EXT"+CHR$(13)
190 X3$="[DOWN2,RIGHT2]3)
   [SPC,SS]EARCH/[SR]EPLACE
   [SPC,SF]ACILITY[SPC,SC]
   OMMANDS"+CHR$(13)
195 XX$="[DOWN,RIGHT6,SO]
   BTAIN THE FOLLOWING BY
    PRESSING[SPC,RIGHT7,
   RVSON,SC,ST,SR,SL,RVSOFF,
   SPC]AND THE LETTER :"
299 REM *** TITLES ***
300 GOSUB 16500:PRINT CHR$(1
   4)CHR$(8)CHR$(144)
310 SP$="[SPC35]":SP$=SP$+SP$
390 FOR I=19990 TO 19999
   :POKE I,255:NEXT
400 POKE 20000,102
410 NR=SS:AD=53246
   :GOSUB 10000
420 NR=CP:AD=53241
   :GOSUB 10000
430 NR=TP:AD=53238
   :GOSUB 10000
499 REM *** MAIN MENU ***
500 PRINT "[CLEAR,DOWN,
   RIGHT14,RVSON,SPC2,SW,SO,
   SR,SD,SP,SR,SO,SK,SPC2,
   RVSOFF]":REM * "WORDPROK"
505 PRINT "[DOWN,RIGHT14,
   RVSON,SPC,SM,SA,SI,SN,SPC]
    [SM,SE,SN,SU,SPC,RVSOFF]"
   :REM * "MAIN MENU"
510 PRINT "[DOWN2,RIGHT11]1)
   [SPC,SE]DIT[SPC,SD]
   OCUMENT"
520 PRINT "[DOWN,RIGHT11]2)
   [SPC,SS]AVE[SPC,SD]
   OCUMENT"
530 PRINT "[DOWN,RIGHT11]3)
   [SPC,SL]OAD[SPC,SD]
   OCUMENT"
540 PRINT "[DOWN,RIGHT11]4)
   [SPC,SP]RINT[SPC,SD]
   OCUMENT"
550 PRINT "[DOWN,RIGHT11]5)
   [SPC,SD]ISK[SPC,SF]ILE
   [SPC,SH]ANDLING"
560 PRINT "[DOWN,RIGHT11]6)
   [SPC,SW]ORD[SPC,SC]OUNT"
570 PRINT "[DOWN,RIGHT11]7)
   [SPC,SR]ESTART[SPC,SP]
   ROGRAM"
580 PRINT "[DOWN,RIGHT11]8)
   [SPC,SE]XIT[SPC,SP]ROGRAM"
590 PRINT "[DOWN,RIGHT5,SW]
   HICH DO YOU REQUIRE (1-8)
    ?[SPC5,LEFT3]";
600 GET A$:A=VAL(A$)
   :IF A<1 OR A>8 THEN 600
610 ON A GOTO 1000,2000,3000,
   4000,5000,7000,8000,9000
999 REM *** EDIT DOCUMENT
    ***
1000 GOSUB 16500:SYS CL
   :POKE 204,0:REM * SCREEN
    COLOUR FILL
1010 GOSUB 15000
1070 SYS SF:REM * SCREEN FILL
1080 SYS CG:REM * ENTER MACH
   INE CODE CHARACTER GET
    ROUTINE
1086 POKE 204,1:REM * CRSR
    OFF
1090 IF PEEK(53240)=1 THEN G
   OSUB 16000:GOTO 500
   :REM * MENU REQUEST
1100 IF PEEK(53240)=2 THEN G
   OSUB 16000:GOTO 12000
   :REM * HELP REQUEST
1110 IF PEEK(53240)=4 THEN G
   OSUB 16000:GOTO 1500
   :REM * SEARCH/REPLACE REQ
   UEST
1119 REM * EXIT CAUSED BY
    MEMORY FULL *
1120 GOSUB 16000:PRINT "
   [CLEAR,DOWN2,RIGHT14,
   RVSON,SM,SE,SM,SO,SR,SY,
   SPC,SF,SU,SL2]![RVSOFF]"
1130 PRINT "[DOWN2,RIGHT6,SY]
   OU HAVE NOW FILLED THE
    MEMORY!"
1140 GOSUB 13000:GOTO 500
```

```
1310 PRINT "[CLEAR,DOWN3,
   RIGHT10,SR]EACHED END OF
    TEXT"
1499 REM *** SEARCH/REPLACE
   ***
1500 PRINT "[CLEAR,DOWN3,
   RIGHT9,RVSON,SS]EARCH/[SR]
   EPLACE[SPC,ST]EXT[RVSOFF]"
1510 PRINT "[DOWN2,RIGHT4,SY]
   OU CAN:"
1520 PRINT "[DOWN,RIGHT6]1)
   [SPC,SS]EARCH FOR TEXT"
1530 PRINT "[DOWN,RIGHT6]2)
   [SPC,SS]EARCH FOR TEXT
    AND REPLACE"
1540 PRINT "[DOWN,RIGHT6]3)
   [SPC,SR]ETURN TO EDITOR"
1550 PRINT "[DOWN2,RIGHT4,SW]
   HICH DO YOU REQUIRE (1-3)
    ? ";
1560 GET A$:A=VAL(A$)
   :IF A<1 OR A>3 THEN 1560
1565 PRINT A$:IF A=3 THEN 10
   00
1570 PRINT "[DOWN2,RIGHT2,SG]
   IVE STRING TO BE SEARCHED
    FOR : ":INPUT "[RIGHT2]";
   SR$:SR=LEN(SR$)
1580 IF SR<2 OR SR>40 THEN P
   RINT "[DOWN,RIGHT2,SI]
   NVALID STRING!":GOTO 1570
1590 FOR I=1 TO SR
   :FC=ASC(MID$(SR$,I,1))
1594 IF FC>218 THEN 1597
1595 IF FC>192 THEN FC=FC-128
   :GOTO 1597
1596 IF FC>63 THEN FC=FC-64
1597 POKE 832+I,FC
1598 NEXT I
1600 POKE 832,SR:POKE 53232,0
1610 IF A=1 THEN 1680
1620 PRINT "[DOWN2,RIGHT2,SG]
   IVE STRING FOR REPLACEMEN
   T : ":INPUT "[RIGHT2]";RP$
   :RP=LEN(RP$)
1630 IF RP<2 OR RP>40 THEN P
   RINT "[DOWN,RIGHT2,SI]
   NVALID STRING!":GOTO 1620
1640 FOR I=1 TO RP
   :FC=ASC(MID$(RP$,I,1))
1644 IF FC>218 THEN 1647
1645 IF FC>192 THEN FC=FC-128
   :GOTO 1647
1646 IF FC>63 THEN FC=FC-64
1647 POKE 875+I,FC
1648 NEXT I
1650 POKE 875,RP:POKE 53232,1
1660 POKE 874,0:IF SR>RP THE
   N POKE 874,1
1670 IF SR=RP THEN POKE 874,2
1680 PRINT "[CLEAR]"
   :PRINT "[DOWN2,RIGHT13,SR]
   EADY TO SEARCH"
1690 GOSUB 13000:PRINT "
   [DOWN2,RIGHT14,RVSON,SPC,
   SS,SE,SA,SR,SC,SH,SI,SN,
   SG,SPC,RVSOFF]"
1700 GOSUB 16500:GOSUB 15000
   :PRINT "[HOME,BLUE,RVSON,
   SPC6,RVSOFF,BLACK,SPC,SE,
   SD,SI,ST,SO,SR] [SS,SE,SA,
   SR,SC,SH]/[SR,SE,SP,SL,SA,
   SC,SE] [SM,SO,SD,SE,SPC]"
1705 PRINT "[HOME,DOWN24]";
   :IF A=2 THEN 1720
1710 PRINT "[BLUE,RVSON,SPC5,
   RVSOFF,BLACK,SPC,SS,SP,SA,
   SC,SE,SPC,RVSON,BLUE]=[SN]
   EXT[SPC7,RVSOFF,BLACK,SR,
   SE,ST,SU,SR,SN,RVSON,BLUE]
   =[SE]DIT[SPC,BLACK,HOME]"
   :GOTO 1740
1720 PRINT "[BLUE,RVSON,SPC2,
   RVSOFF,BLACK,SPC,SS,SP,SA,
   SC,SE,SPC,RVSON,BLUE]=[SN]
   EXT[SPC2,RVSOFF,BLACK,SR,
   RVSON,BLUE]=[SR]EPLACE
   [SPC2,RVSOFF,BLACK,SR,SE,
   ST,SU,SR,SN,RVSON,BLUE]=
   [SE]DIT[BLACK,HOME]"
1740 SYS ZR:IF PEEK(53233)=0
    THEN 1000
1750 GOSUB 16000:PRINT "
   [CLEAR,BLACK,DOWN3,
   RIGHT11,SR]EACHED END OF
    TEXT"
1760 GOSUB 13000:GOTO 1000
1999 REM *** SAVE DOCUMENT
   ***
2000 PRINT "[CLEAR]";
   CHR$(142);"[DOWN3,RIGHT13,
   RVSON]SAVE DOCUMENT
   [RVSOFF]"
2010 PRINT "[DOWN2,RIGHT4]DO
    YOU WISH TO SAVE TEXT
    (Y/N) ?"
2020 GET A$:IF A$="N" THEN 2
   150
2030 IF A$<>"Y" THEN 2020
2040 PRINT "[DOWN2,RIGHT4]
   HAVE YOU SET THE[SPC,
   RVSON]B[RVSOFF]EGINNING
    AND[SPC,RVSON]E[RVSOFF]
   ND"
2050 PRINT "[RIGHT4]MARKERS
    FOR THE TEXT TO BE SAVED"
2060 PRINT "[RIGHT4](Y/N)
   ?"
2070 GET A$:IF A$="N" THEN 2
   150
2080 IF A$<>"Y" THEN 2070
2090 GOSUB 18000:GOSUB 13090
2100 PRINT "[DOWN,RIGHT16,
   RVSON,SPC]SAVING[SPC,
   RVSOFF]"
2110 SYS SV
2120 IF PEEK(53222)=0 THEN 2
   140
2130 PRINT "[UP,RIGHT4]
   MARKERS NOT POSITIONED
    CORRECTLY":GOSUB 13100
   :GOTO 2150
2140 GOSUB 14000:GOSUB 13100
2150 PRINT "[CLEAR]";CHR$(14)
   :GOTO 500
2999 REM *** LOAD DOCUMENT
   ***
3000 PRINT "[CLEAR]";
   CHR$(142);"[DOWN3,RIGHT13,
   RVSON]LOAD DOCUMENT
   [RVSOFF]"
3010 PRINT "[DOWN2,RIGHT4]DO
    YOU WISH TO LOAD TEXT
    (Y/N) ?"
3020 GET A$:IF A$="N" THEN 3
   070
3030 IF A$<>"Y" THEN 3020
3040 PRINT "[DOWN2,RIGHT4]
   HAVE YOU SET THE CURSOR
    TO THE "
3041 PRINT "[RIGHT4]START
    POSITION OF THE LOAD (Y/
   N) ?"
3042 GET A$:IF A$="N" THEN 3
   070
3043 IF A$<>"Y" THEN 3042
3044 GOSUB 18000:GOSUB 13090
3045 PRINT "[DOWN,RIGHT15,
   RVSON,SPC]LOADING[SPC,
   RVSOFF]"
3050 SYS LD
3060 GOSUB 14000:GOSUB 13100
3070 PRINT "[CLEAR]";CHR$(14)
   :GOTO 500
3999 REM *** PRINTOUT OF TEX
   T ***
4000 PRINT "[CLEAR,DOWN3,
   RIGHT13,RVSON,SP]RINT[SPC,
   SO]UT[SPC,ST]EXT[RVSOFF]"
4010 PRINT "[DOWN2,RIGHT4,SD]
   O YOU WISH TO PRINT TEXT
    ([SY]/[SN]) ? ";
4020 GET A$:IF A$="N" THEN 5
   00
4025 IF A$<>"Y" THEN 4020
4030 PRINT "[SY]"
   :PRINT "[DOWN,RIGHT4,SH]
```

printing will pause the printout. Pressing SPACE will restart printing, and pressing F7 will terminate it. A message will appear when printing is complete and pressing SPACE will cause a return to the main menu.

5. DISK FILE HANDLING

This option allows you to perform some extra operations on the current disk. These are as follows:

1. Disk Directory: A directory of the current disk is printed on the screen. Pressing SHIFT will pause the listing. The document in memory is not affected.
2. File Rename: A disk file may be renamed. The current and new filenames are requested, and the renaming procedure is carried out. Filenames may be up to 16 characters long.
3. File Delete: A disk file may be scratched from the disk. The filename is requested, and the delete procedure is carried out. The filename may be up to 16 characters long, and wild card filenames are acceptable.
4. Exit: This causes a return to the main menu.

6. WORD COUNT

This allows the number of words in the current document to be counted. Words are counted from the first beginning marker (B) to the first end marker (E or ⌘), and an exit option is given if these have not been set up. The number of words in this block is then displayed, and pressing SPACE will cause a return to the main menu.

7. RESTART

This option causes a restart, and the document currently in memory is lost. A return is made to the main menu.

8. EXIT

This option causes exit from the program, and returns to Basic control.

Limitations of the Program

a) Editor: The word split/unsplit option works by forcing a line feed if a space is encountered in the last 10 columns of the screen width. Thus if a long word occurs at the end of a line, it may be split between lines.

b) Device availability trapping: If the load, save, disk directory or printout routines are

```
  AVE YOU SET THE[SPC,RVSON,
   SB,RVSOFF]EGINNING AND
   [SPC,RVSON,SE,RVSOFF]ND"
4031 PRINT "[RIGHT4]MARKERS
   FOR THE TEXT TO BE PRINT
   ED"
4032 PRINT "[RIGHT4]([SY]/
   [SN]) ? ";
4033 GET A$:IF A$="N" THEN 5
   00
4034 IF A$<>"Y" THEN 4033
4035 PRINT "[SY,CLEAR]"
4040 PRINT "[DOWN2,RIGHT4,SG]
   IVE WIDTH OF LEFT HAND
   MARGIN"
4045 INPUT "[RIGHT4](1-30)
   : ";LM$:LM=VAL(LM$)
4050 IF LM<1 OR LM>30 OR LM<
   >INT(LM) THEN PRINT "
   [DOWN,RIGHT4,SI]NVALID
   [SPC,SN]UMBER!":GOTO 4040
4052 POKE 53201,LM
4055 PRINT "[DOWN2,RIGHT4,SG]
   IVE WIDTH OF RIGHT HAND
   MARGIN"
4060 INPUT "[RIGHT4](1-30)
   : ";RM$:RM=VAL(RM$)
4065 IF RM<1 OR RM>30 OR RM<
   >INT(RM) THEN PRINT "
   [DOWN,RIGHT4,SI]NVALID
   [SPC,SN]UMBER!":GOTO 4055
4067 POKE 53202,80-LM-RM
4070 TL=80-LM-RM
4080 PRINT "[DOWN2,RIGHT4,SD]
   O YOU REQUIRE A HOLD AFTE
   R EACH"
4081 PRINT "[RIGHT4]PRINTED
   PAGE ([SY]/[SN]) ? ";
4082 POKE 53205,0:GET A$
   :IF A$="Y" THEN POKE 5320
   5,1:PRINT "[SY]":GOTO 4085
4083 IF A$<>"N" THEN 4082
4084 PRINT "[SN]"
4085 PRINT "[CLEAR,DOWN3,
   RIGHT4,SP]AGE NUMBERING
   TYPES AVAILABLE :"
4086 PRINT "[DOWN2,RIGHT4]1)
   [SPC,SN]O PAGE NUMBERS"
4087 PRINT "[DOWN,RIGHT4]2)
   [SPC,SP]AGE NUMBERS AT
   TOP OF PAGE"
4088 PRINT "[DOWN,RIGHT4]3)
   [SPC,SP]AGE NUMBERS AT
   FOOT OF PAGE"
4089 PRINT "[DOWN2,RIGHT4,SW]
   HICH DO YOU REQUIRE (1-3)
   ? ";
4090 GET A$:A=VAL(A$)
   :IF A<1 OR A>3 THEN 4090
4091 PRINT A$:POKE 53215,A-1
   :IF A=1 THEN 4150
4100 PRINT "[DOWN2,RIGHT4,SG]
   IVE NUMBER OF FIRST PAGE"
4105 INPUT "[RIGHT4](1-900)
   ";PC$:PC=VAL(PC$)
4106 IF PC=0 OR PC>900 OR PC
   <>INT(PC) THEN 4100
4107 IF PC<100 THEN PC$="0"+
   PC$:IF PC<10 THEN PC$="0"
   +PC$
4108 FOR I=1 TO 3
   :IF MID$(PC$,I,
   1)<"0" OR MID$(PC$,I,
   1)>"9" THEN 4115
4109 NEXT
4110 IF PC>0 AND PC<901 THEN
   4120
4115 PRINT "[DOWN,RIGHT4,SI]
   NVALID[SPC,SN]UMBER!!"
   :GOTO 4100
4120 FOR I=1 TO 3
4130 POKE 53207+I,
   ASC(MID$(PC$,4-I,1)):NEXT
4140 POKE 53216,INT((80-LM-R
   M)/2)+LM-2
4150 PRINT "[CLEAR,DOWN3,
   RIGHT4,SH]OW MANY LINES
   PER PAGE"
4155 PRINT "[RIGHT4]
   (NORMALLY 65) ";
4160 INPUT A$:A=VAL(A$)
   :IF A<15 OR A>100 OR A<>I
   NT(A) THEN 4150
4165 POKE 53204,A-9
4170 PRINT "[DOWN2,RIGHT4,SH]
   OW MANY COPIES DO YOU REQ
   UIRE[SPC10](1-9) ? ";
4180 GET A$:CI=VAL(A$)
   :IF CI<1 THEN 4180
4182 PRINT A$
4185 POKE 53206,CI
   :POKE 53190,0:POKE 53196,0
4190 PRINT "[CLEAR,DOWN3,
   RIGHT4,SY]OU CAN PRINT
   TO"
4191 PRINT "[DOWN,RIGHT4]1)
   [SPC,SC]OMMODORE PRINTER
   ([SD]EVICE 4)"
4192 PRINT "[DOWN,RIGHT4]2)
   [SPC,SC]ENTRONICS PRINTER"
4193 PRINT "[DOWN3,RIGHT4,SW]
   HICH DO YOU REQUIRE (1/2)
   ? ";
4194 GET A$:IF A$<>"1" AND A
   $<>"2" THEN 4194
4195 POKE 53188,VAL(A$)-1
   :PRINT A$
4200 PRINT "[CLEAR,DOWN2,
   RIGHT4,SE]NSURE PRINTER
   IS SWITCHED ON"
4210 PRINT "[DOWN,RIGHT4]AND
   POSITION PAPER AT FOLD
   :"
4215 IF A$="2" THEN PRINT
   :GOTO 4260
4220 PRINT "[DOWN,RIGHT4,C8,
   RVSON]O[SPC30]O"
4230 PRINT "[RIGHT4,RVSON]
   -------------------------
   -------"
4240 PRINT "[RIGHT4,RVSON]O
   [BLACK,SPC,C4,SPC,BLACK,
   SPC,C8,SPC27]O"
4250 PRINT "[RIGHT4,RVSON,C4,
   C+,BLACK,SPC,C4,SPC,BLACK,
   SPC,C4,C+28,BLACK]"
4260 PRINT "[DOWN,RIGHT2,SP]
   RESS[SPC,RVSON,SPC,SS,SP,
   SA,SC,SE] [RVSOFF,SPC]TO
   COMMENCE PRINTING :"
   :GOSUB 13020
4270 PRINT "[CLEAR,BLACK,
   DOWN5,RIGHT3,SP]RESS[SPC,
   RVSON,SS,SH,SI,SF,ST,
   RVSOFF,SPC]TO INTERRUPT
   PRINTING"
4275 PRINT "[WHITE,RIGHT11,
   RVSON,SPC,SP,SR,SI,SN,ST,
   SI,SN,SG] [SP,SA,SU,SS,SE,
   SD,SPC,RVSOFF]"
4280 PRINT "[BLACK,DOWN2,
   RIGHT15,RVSON,SPC,SP,SR,
   SI,SN,ST,SI,SN,SG,SPC,
   RVSOFF]"
4285 PRINT "[WHITE,SPC5,SP]
   RESS[SPC,RVSON,SPC,SS,SP,
   SA,SC,SE,SPC,RVSOFF,SPC7,
   SP]RESS[SPC,RVSON,SPC]F7
   [SPC,RVSOFF]"
4287 PRINT "[SPC6]
   TO CONTINUE[SPC8]
   TO ABANDON[BLACK]"
4290 SYS PO
4292 POKE 53280,6
4295 IF PEEK(53189)<>5 THEN
   4300
4297 PRINT "[CLEAR,DOWN4,
   RIGHT9,SP]RINTER NOT AVAI
   LABLE![DOWN3]":GOSUB 13000
   :GOTO 500
4300 IF PEEK(53222)=0 THEN 4
   400
4310 PRINT "[CLEAR,DOWN4,
   RIGHT4,SM]ARKERS NOT POSI
   TIONED CORRECTLY![DOWN3]"
4320 GOSUB 13000:GOTO 500
4400 PRINT "[CLEAR,DOWN4,
   RIGHT10,RVSON,SPC,SP,SR,
   SI,SN,ST,SI,SN,SG,SPC,SC,
   SO,SM,SP,SL,SE,ST,SE,SD,
   SPC,RVSOFF,DOWN3]"
4410 GOSUB 13000:GOTO 500
4999 REM *** DISK HANDLING
   ROUTINES ***
5000 PRINT "[CLEAR,DOWN3,
   RIGHT10,RVSON,SD]ISK[SPC,
   SF]ILE[SPC,SH]ANDLING
   [RVSOFF]"
5050 PRINT "[DOWN2,RIGHT4]1)
   [SPC,SD]ISK[SPC,SD]
   IRECTORY"
5060 PRINT "[DOWN,RIGHT4]2)
   [SPC,SR]ENAME A[SPC,SF]
   ILE"
5070 PRINT "[DOWN,RIGHT4]3)
   [SPC,SD]ELETE A[SPC,SF]
   ILE"
5090 PRINT "[DOWN,RIGHT4]4)
   [SPC,SR]ETURN TO[SPC,SM]
   AIN[SPC,SM]ENU"
5100 PRINT "[DOWN2,RIGHT4,SW]
   HICH DO YOU REQUIRE (1-4)
   ?"
5110 GET A$:A=VAL(A$)
   :IF A<1 OR A>4 THEN 5110
5120 ON A GOTO 5200,5500,
   5700,500
5199 REM ** DISK DIRECTORY
   **
5200 PRINT "[CLEAR]";
   CHR$(142):PRINT "[DOWN2,
   SPC4]PRESS[SPC,RVSON]
   SHIFT[RVSOFF,SPC]TO PAUSE
   DIRECTORY[DOWN2]"
5210 SYS DR
5220 GOSUB 13100
5230 PRINT "[CLEAR]";CHR$(14)
   :GOTO 500
5499 REM ** RENAME A FILE
   **
5500 PRINT "[CLEAR]";
   CHR$(142)
5510 PRINT "[DOWN2,RIGHT4]
   GIVE PRESENT FILENAME :"
5520 PRINT "[DOWN,RIGHT6]
   1234567890123456"
5530 INPUT "[RIGHT4]";N1$
   :N1=LEN(N1$)
5540 IF N1<2 OR N1>16 THEN P
   RINT "[DOWN,RIGHT4]
   INVALID FILENAME!!"
   :GOTO 5510
```

```
5550 PRINT "[DOWN2,RIGHT4]
   GIVE NEW FILENAME :"
5560 PRINT "[DOWN,RIGHT6]
   1234567890123456"
5570 INPUT "[RIGHT4]";N2$
   :N2=LEN(N2$)
5580 IF N2<2 OR N2>16 THEN P
   RINT "[DOWN,RIGHT4]
   INVALID FILENAME!!"
   :GOTO 5550
5590 PRINT "[DOWN2,RIGHT15,
   RVSON,SPC]RENAMING[SPC,
   RVSOFF]"
5595 FM$=N1$
5600 OPEN 15,8,15,"R
   :"+N2$+"="+N1$:CLOSE 15
5610 OPEN 15,8,15
   :INPUT#15,ER,ER$:CLOSE 15
5620 IF ER>19 THEN PRINT "
   [CLEAR,DOWN3,RIGHT7]FILE
   ERROR!":GOSUB 14040
5630 GOSUB 13100:PRINT "
   [CLEAR]";CHR$(14):GOTO 500
5699 REM ** DELETE FILE **
5700 PRINT "[CLEAR]";
   CHR$(142)
5710 PRINT "[DOWN2,RIGHT4]
   GIVE NAME OF FILE TO BE
    DELETED :"
5720 PRINT "[DOWN,RIGHT6]
   1234567890123456"
5730 INPUT "[RIGHT4]";N1$
   :N1=LEN(N1$)
5740 IF N1<2 OR N1>16 THEN P
   RINT "[DOWN,RIGHT4]
   INVALID FILENAME!!"
   :GOTO 5710
5750 PRINT "[DOWN2,RIGHT15,
   RVSON,SPC]DELETING[SPC,
   RVSOFF]"
5760 OPEN 15,8,15,"S:"+N1$
   :CLOSE 15
5770 OPEN 15,8,15
   :INPUT#15,ER,ER$:CLOSE 15
5780 IF ER>19 THEN PRINT "
   [DOWN,RIGHT10]FILE ERROR!"
   :GOSUB 14040
5790 GOSUB 13100:PRINT "
   [CLEAR]";CHR$(14):GOTO 500
5920 GOSUB 13000:GOTO 500
6999 REM *** WORD COUNT ***
7000 PRINT "[CLEAR,DOWN2,
   RIGHT14,RVSON,SW,SO,SR,SD]
    [SC,SO,SU,SN,ST,RVSOFF]
7010 PRINT "[DOWN2,RIGHT3,SH]
   AVE YOU SET THE[SPC,RVSON,
   SB,RVSOFF]EGINNING AND
   [SPC,RVSON,SE,RVSOFF]ND"
7020 PRINT "[RIGHT3]MARKERS
    FOR THE TEXT TO BE COUNT
   ED"
7030 PRINT "[RIGHT3]([SY]/
   [SN]) ?"
7040 GET A$:IF A$="N" THEN 1
   000
7050 IF A$<>"Y" THEN 7040
7110 PRINT "[DOWN3,SPC3,ST]
   HIS TEXT CONTAINS";
7120 SYS WC:REM * DO WORD
    COUNT
7130 PRINT PEEK(53236)+(256*
   PEEK(53237));"WORDS."
7140 PRINT "[DOWN3,SPC3,SP]
   RESS[SPC,RVSON,SPC,SS,SP,
   SA,SC,SE] [RVSOFF,SPC]TO
    CONTINUE :"
7150 GET A$:IF A$<>" " THEN
   7150
7160 GOTO 500
7999 REM *** RESTART PROGRAM
    ***
8000 PRINT "[CLEAR,DOWN2,
   RIGHT16,RVSON,SR,SE,SS,ST,
   SA,SR,ST,RVSOFF]"
8010 PRINT "[DOWN3,RIGHT5,SD]
   O YOU WISH TO RESTART (
   [SY]/[SN]) ?"
8020 GET A$:IF A$="N" THEN 5
   00
8030 IF A$<>"Y" THEN 8020
8040 GOTO 100
8999 REM *** EXIT PROGRAM
    ***
9000 PRINT "[CLEAR,DOWN2,
   RIGHT18,RVSON,SE,SX,SI,ST,
   RVSOFF]"
9010 PRINT "[DOWN3,RIGHT5,SD]
   O YOU WISH TO EXIT ([SY]/
   [SN]) ?"
9020 GET A$:IF A$="N" THEN 5
   00
9030 IF A$<>"Y" THEN 9020
9040 PRINT CHR$(147)CHR$(9)C
   HR$(142)"[DOWN20,SPC2,
   LEFT3]";
9050 POKE 631,32:POKE 632,20
   :POKE 198,2
9060 END
9999 REM *** SET UP DOUBLE
    BYTE IN MEMORY ***
10000 HB=INT(NR/256)
   :LB=NR-(HB*256)
10010 POKE AD,LB:POKE AD+1,HB
   :RETURN
10499 REM *** GET NUMBER FRO
   M TWO BYTES ***
10500 NR=PEEK(AD)+(256*PEEK(
   AD+1)):RETURN
11999 REM *** HELP FACILITY
    **
12000 PRINT ET$;X1$
12009 PRINT "[DOWN,RIGHT5,
   RVSON,SC,ST,SR,SL,RVSOFF,
   SPC,LEFT-ARROW,SPC2,SR]
   ETURN TO[SPC,SM]ENU"
12010 PRINT "[DOWN,RIGHT5,
   RVSON,SC,ST,SR,SL,RVSOFF,
   SPC,UP-ARROW,SPC2,SP]RINT
   [SPC,SE]DITOR[SPC,SC]
   OMMANDS"
12011 PRINT "[DOWN,RIGHT5,
   RVSON,SC,ST,SR,SL,RVSOFF,
   SPC]£[SPC2,SE]NTER[SPC,SS]
   EARCH/[SR]EPLACE[SPC,SM]
   ODE"
12013 PRINT "[DOWN,RIGHT5,
   RVSON,SC,ST,SR,SL,RVSOFF,
   SPC]=[SPC2,SK]EY[SPC,SR]
   EPEAT[SPC,SO]N/[SO]FF"
12014 GOSUB 13000
12015 PRINT ET$;X1$
12016 PRINT "[DOWN,RIGHT,
   RVSON,SC,SR,SS,SR,RVSOFF]
    [SR]IGHT[SPC2,SM]OVE[SPC,
   SC]URSOR[SPC,SF]ORWARD
   [SPC,SO]NCE"
12017 PRINT "[DOWN,RIGHT,
   RVSON,SC,SR,SS,SR,RVSOFF]
    [SL]EFT[SPC3,SM]OVE[SPC,
   SC]URSOR[SPC,SB]ACK[SPC,
   SO]NCE"
12018 PRINT "[DOWN,RIGHT,
   RVSON,SC,SR,SS,SR,RVSOFF]
    [SU]P[SPC5,SM]OVE[SPC,SC]
   URSOR[SPC,SB]ACK 40"
12019 PRINT "[DOWN,RIGHT,
   RVSON,SC,SR,SS,SR,RVSOFF]
    [SD]OWN[SPC3,SM]OVE[SPC,
   SC]URSOR[SPC,SF]ORWARD
    40"
12020 GOSUB 13000
12021 PRINT ET$;X1$
12022 PRINT "[DOWN,RIGHT5,
   RVSON,SC,SL,SR,RVSOFF,
   SPC3,SS]PLIT/[SU]NSPLIT
   [SPC,SW]ORDS"
12023 PRINT "[DOWN,RIGHT5,
   RVSON,SH,SO,SM,SE,RVSOFF,
   SPC2,SM]OVE[SPC,SC]URSOR
    TO TOP OF SCREEN"
12030 GOSUB 13000
12032 PRINT ET$;X1$
12035 PRINT "[DOWN,RIGHT6,
   RVSON,SPC]F1[SPC,RVSOFF,
```

entered, and the required device is not present, an error message will appear and pressing SPACE will cause a return to the main menu. If file deleting or renaming is attempted without a disk drive available, the program will break and return to Basic. Re-entry to the program is possible by typing GOTO 500.

c) Printing: As each line is formatted for printing, single or double spaces at the beginning or end of lines are removed to assist in keeping straight margins. Thus if an indentation to indicate the start of a paragraph etc. is required, it should be at least three spaces long.

d) Word count: This routine increments the word counter each time it encounters a non-space/space combination in the text. Thus hyphens, commas, full stops etc. will be counted as words unless there is no space between them and a word, and the word count should only be taken as an approximate figure of the number of actual words.

e) STOP and RESTORE: Whilst in the editor, the STOP key is disabled, but holding down STOP and pressing RESTORE will reset the computer as usual. Re-entry is not possible. But with the editor, STOP and RESTORE behave as usual.

f) Memory usage: The Basic program is about 10K long, and resets the top of Basic memory to 19968 ($4E00). The text is stored from 120000 ($4E20) up to a maximum of 40959 ($9FFF). The machine code is situated in the 4K RAM space starting at 49152 ($C000) and is just over 3K in length. The remaining 1K is used for data storage by the machine code routines.

Notes on Typing the Programs

Typing in the program should pose few difficulties, though care should be taken with the data, and some of the print statements. A checksum is included in the data loader, and this will detect most errors in the data. If an error occurs, check variables A and C to assist in debugging the data. While typing the data, a running check of line length comparisons should be made e.g. if line 1300 is two characters longer than line 1290 in the

```
   SPC3,ST,SA,SB,SPC]([SP]
   RINT FIVE SPACES)
12Ø4Ø PRINT "[DOWN,RIGHT6,
   RVSON,SPC]F3[SPC,RVSOFF,
   SPC3,SD]ELETE WORD BEFORE
    CURSOR"
12Ø45 PRINT "[DOWN,RIGHT6,
   RVSON,SPC]F5[SPC,RVSOFF,
   SPC3,SC]URSOR BACK TO LAS
   T SPACE"
12Ø5Ø PRINT "[DOWN,RIGHT6,
   RVSON,SPC]F7[SPC,RVSOFF,
   SPC3,SC]URSOR FORWARD TO
    NEXT"
12Ø51 PRINT "[RIGHT6,SPC7]
   SPACE"
12Ø55 GOSUB 13ØØØ
12Ø6Ø PRINT ET$;X1$
12Ø62 PRINT "[DOWN,RIGHT6,
   RVSON,SPC]F2[SPC,RVSOFF,
   SPC3,SM]OVE CURSOR UP ONE
    PAGE"
12Ø63 PRINT "[DOWN,RIGHT6,
   RVSON,SPC]F4[SPC,RVSOFF,
   SPC3,SD]ELETE 4Ø CHARS
    BEFORE[SPC18]CURSOR"
12Ø64 PRINT "[DOWN,RIGHT6,
   RVSON,SPC]F6[SPC,RVSOFF,
   SPC3,SI]NSERT 4Ø SPACES
    AT CURSOR"
12Ø65 PRINT "[DOWN,RIGHT6,
   RVSON,SPC]F8[SPC,RVSOFF,
   SPC3,SM]OVE CURSOR DOWN
    ONE PAGE"
12Ø67 GOSUB 13ØØØ
12Ø68 PRINT ET$;X1$
12Ø7Ø PRINT "[DOWN,RIGHT2,
   RVSON,SC,SB,SM,RVSOFF,SPC,
   RVSON,SPC]F1[SPC,RVSOFF,
   SPC2,SC]HANGE BACKGROUND
    COLOUR"
12Ø72 PRINT "[DOWN,RIGHT2,
   RVSON,SC,SB,SM,RVSOFF,SPC,
   RVSON,SPC]F3[SPC,RVSOFF,
   SPC2,SC]HANGE BORDER COLO
   UR"
12Ø74 PRINT "[DOWN,RIGHT2,
   RVSON,SC,SB,SM,RVSOFF,SPC,
   RVSON,SPC]F5[SPC,RVSOFF,
   SPC2,SC]HANGE TEXT COLOUR"
12Ø8Ø GOSUB 13ØØØ
12Ø92 PRINT ET$;X2$;XX$
121ØØ PRINT "[DOWN,RIGHT8,
   RVSON,LEFT-ARROW,RVSOFF,
   SPC2,SR,SE,ST,SU,SR,SN,
   SPC,SC]HARACTER"
1211Ø PRINT "[DOWN,RIGHT8,
   RVSON,SP,RVSOFF,SPC2,SF]
   ORCE[SPC,SN]EW[SPC,SP]AGE"
1212Ø PRINT "[DOWN,RIGHT8,
   RVSON,SD,RVSOFF,SPC2,SD]
   OUBLE[SPC,SL]INE[SPC,SS]
   PACING"
1213Ø PRINT "[DOWN,RIGHT8,
   RVSON,SS,RVSOFF,SPC2,SS]
   INGLE[SPC,SL]INE[SPC,SS]
   PACING"
1216Ø GOSUB 13ØØØ
1217Ø PRINT ET$;X2$;XX$
1218Ø PRINT "[DOWN,RIGHT8,
   RVSON,SR,RVSOFF,SPC2,SR]
   IGHT[SPC,SJ]USTIFY[SPC,ST]
   EXT"
1219Ø PRINT "[DOWN,RIGHT8,
   RVSON,SL,RVSOFF,SPC2,SL]
   EFT[SPC,SJ]USTIFY[SPC,ST]
   EXT"
122ØØ PRINT "[DOWN,RIGHT8,
   RVSON,SJ,RVSOFF,SPC2,SR]
   IGHT &[SPC,SL]EFT[SPC,SJ]
   USTIFY[SPC,ST]EXT"
1221Ø PRINT "[DOWN,RIGHT8,
   RVSON,SC,RVSOFF,SPC2,SC]
   ENTRALISE[SPC,ST]EXT ON
   [SPC,SL]INE"
12234 GOSUB 13ØØØ
12236 PRINT ET$;X2$;XX$
1226Ø PRINT "[DOWN,RIGHT8,
   RVSON,SB,RVSOFF,SPC2,SB]
   EGINNING OF[SPC,SB]LOCK
   [SPC,SM]ARKER"
1227Ø PRINT "[DOWN,RIGHT8,
   RVSON,SE,RVSOFF,SPC2,SE]
   ND OF[SPC,SB]LOCK[SPC,SM]
   ARKER"
12275 GOSUB 13ØØØ
1228Ø PRINT ET$;X3$
1229Ø PRINT "[DOWN,RIGHT6,
   RVSON,SC,ST,SR,SL,RVSOFF,
   SPC]£[SPC2,SE]NTER[SPC,SS]
   EARCH/[SR]EPLACE[SPC,SM]
   ODE"
123ØØ PRINT "[DOWN2,RIGHT5,
   SW]HEN[SPC,SS]EARCH[SPC,
   SS]TRING IS[SPC,SF]OUND
    :"
1231Ø PRINT "[DOWN,RIGHT11,
   SR,SPC2,SR]EPLACE[SPC,SS]
   EARCH[SPC,SS]TRING"
1232Ø PRINT "[DOWN,RIGHT5,
   RVSON,SPC,SS,SP,SA,SC,SE,
   SPC,RVSOFF,SPC2,SF]IND
   [SPC,SN]EXT[SPC,SO]
   CCURRENCE OF"
12325 PRINT "[RIGHT14,SS]
   EARCH[SPC,SS]TRING"
1233Ø PRINT "[DOWN,RIGHT6,
   RVSON,SR,SE,ST,SU,SR,SN,
   RVSOFF,SPC2,SL]EAVE[SPC,
   SS]EARCH/[SR]EPLACE[SPC,
   SM]ODE"
12335 PRINT "[RIGHT14]AND
   [SPC,SR]ETURN TO[SPC,SE]
   DITOR"
1245Ø GOSUB 13ØØØ:GOTO 1ØØØ
12999 REM *** WAIT FOR SPACE
    PRESS ***
13ØØØ PRINT "[DOWN,RIGHT7,SP]
   RESS[SPC,RVSON,SPC,SS,SP,
   SA,SC,SE] [RVSOFF,SPC]TO
    CONTINUE :"
13Ø2Ø GET A$:IF A$<>" " THEN
    13Ø2Ø
13Ø3Ø RETURN
13Ø9Ø PRINT "[DOWN,RIGHT12]
   PREPARE DISK AND"
131ØØ PRINT "[DOWN,RIGHT7]
   PRESS[SPC,RVSON,SPC]
   SPACE [RVSOFF,SPC]
   TO CONTINUE :"
1312Ø GOTO 13Ø2Ø
13999 REM *** GET DISK STATU
   S ***
14ØØØ IF ST<>Ø AND ST<>64 TH
   EN 14Ø1Ø
14ØØ5 PRINT "[UP,RIGHT9,
   RVSON]FILE TRANSFER COMPL
   ETED[RVSOFF]":GOTO 14Ø5Ø
14Ø1Ø PRINT "[CLEAR,DOWN3,
   RIGHT7]FILE TRANSFER ERRO
   R!!"
14Ø2Ø IF ST<>-128 THEN 14Ø3Ø
14Ø25 PRINT"[CLEAR,DOWN3,
   RIGHT7]DISK DRIVE NOT AVA
   ILABLE OR"
14Ø26 PRINT"[RIGHT7]
   FILE EXISTS![DOWN2]"
14Ø28 GOTO 14Ø5Ø
14Ø3Ø OPEN 16,8,15
   :INPUT#16,ER,ER$:CLOSE 16
14Ø35 IF ER<2Ø THEN 14Ø5Ø
14Ø4Ø PRINT "[DOWN,RIGHT7]
   ERROR #";ER
14Ø45 PRINT "[DOWN,RIGHT7](";
   ER$;")"
14Ø48 PRINT "[DOWN,RIGHT7]
   FILENAME : ";FM$
14Ø5Ø RETURN
14499 REM *** GET N CHARS
    FROM DISK BUFFER ***
145ØØ Z$="":FOR I=1 TO N
   :GOSUB 1452Ø
1451Ø Z$=Z$+A$:NEXT:RETURN
1452Ø GET#3,A$:IF A$="" THEN
    A$=CHR$(Ø)
1453Ø A=ASC(A$):BP=BP+1
   :RETURN
14999 REM *** PRINT EDITOR
    HEADER/FOOTER ***
15ØØØ PRINT "[CLEAR,RVSON,
   BLUE,SPC12,RVSOFF,BLACK,
   SPC,SW,SO,SR,SD,SP,SR,SO,
   SK,SPC,SE,SD,SI,ST,SO,SR,
   SPC,RVSON,BLUE,SPC11]";NO$
15Ø1Ø PRINT "[BLUE,DOWN2Ø,
   RVSON,BLUE]";NO$;
15Ø2Ø PRINT "[RVSON,SPC4,
   RVSOFF,BLACK,SC,ST,SR,SL,
   RVSON,BLUE,SPC,RVSOFF,
   BLACK,UP-ARROW,RVSON,BLUE,
   SPC]FOR[SPC,SH,SE,SL,SP,
   SPC2,RVSOFF,BLACK,SC,ST,
   SR,SL,RVSON,BLUE,SPC,
   BLACK,RVSOFF,LEFT-ARROW,
   RVSON,BLUE,SPC]FOR[SPC,SM,
   SE,SN,SU,SPC3,HOME,DOWN2,
   BLACK,RVSOFF]";
15Ø3Ø POKE 2Ø23,16Ø
   :POKE 56295,6:POKE 1944,
   177:POKE 56216,6
   :REM * LAST SQUARE
15Ø4Ø RETURN
15999 REM *** SAVE CURRENT
    EDITOR COLOURS ***
16ØØØ POKE 53248,PEEK(5328Ø)
   :POKE 53249,PEEK(53281)
16Ø1Ø POKE 5328Ø,6
   :POKE 53281,1:PRINT CHR$(
   144):RETURN
16499 REM *** RETURN PREVIOU
   S COLOURS ***
165ØØ POKE 5328Ø,PEEK(53248)
   :POKE 53281,PEEK(53249)
   :RETURN
17999 REM *** GET AND STORE
    FILENAME ***
18ØØØ PRINT "[DOWN2,RIGHT23]
   123456789Ø12"
18Ø1Ø INPUT "[RIGHT5]GIVE
    FILENAME : ";FM$
18Ø2Ø IF LEN(FM$)<1 OR LEN(F
   M$)>12 THEN 18ØØØ
18Ø3Ø FM$=FM$+".TXT"
18Ø4Ø POKE 832,LEN(FM$)
18Ø5Ø FOR I=1 TO LEN(FM$)
   :FC$=MID$(FM$,I,1)
   :FC=ASC(FC$)
18Ø6Ø IF FC$="*" OR FC$="?"
   OR (FC$="." AND I<>LEN(FM
   $)-3) THEN 18Ø9Ø
18Ø7Ø POKE 832+I,FC:NEXT
18Ø8Ø RETURN
18Ø9Ø PRINT "[DOWN,RIGHT5]
   INVALID FILENAME!!"
   :GOTO 18ØØØ
<>-128 THEN 14Ø3Ø
```

listing, it should also be two characters longer in the version typed on your screen.

In the main word processor program itself, particular care should be taken when typing the following lines (refer to the table of Commodore control characters elsewhere in this issue):

15000-15030 – this prints the header/footer for the editor and must be exactly the right length.

1700-1720 – this prints the header/footer for the search & replace facility, and again must be the correct length.

4220-4250 – this is a sketch of the paper fold position for printing out on a 1525 dot matrix printer.

4270-4287 – on-screen printing instructions. Note that some of the text is in black, and some in white. During printing, the screen is white, and so only the black text is visible. When printing is paused, the screen becomes black, hence making the white text visible.

How it Works

10-90	Set up and load machine code section
100-128	Set up start addresses of machine code routines
130-430	Set up more variables and memory
500-610	Main menu selection
1000-1310	Editor entry/exit handling
1500-1760	Search/replace handling
2000-2150	Save routine set up
3000-3070	Load routine set up
4000-4195	Printout option selection
4200-4410	Printout entry/exit handling
5000-5920	Disk file handling routines
7000-7160	Word count handling
8000-8040	Restart program
9000-9050	Exit program
10000-10010	Put double byte number into memory
10500	Get double byte number from memory
12000-12450	On-screen help facility
13000-13120	Press SPACE requests (upper and lower case)
14000-14050	Get disk status and print any errors
15000-15040	Set up editor screen header/footer
16000-16500	Save and replace editor screen colours
18000-18090	Get filename and transfer to memory

```
14025 PRINT"[CLEAR,DOWN3,
   RIGHT7]DISK DRIVE NOT AVA
   ILABLE OR"
14026 PRINT"[RIGHT7]
   FILE EXISTS![DOWN2]"
14028 GOTO 14050
14030 OPEN 16,8,15
   :INPUT#16,ER,ER$:CLOSE 16
14035 IF ER<20 THEN 14050
14040 PRINT "[DOWN,RIGHT7]
   ERROR #";ER
14045 PRINT "[DOWN,RIGHT7](";
   ER$;")"
14048 PRINT "[DOWN,RIGHT7]
   FILENAME : ";FM$
14050 RETURN
14499 REM *** GET N CHARS
    FROM DISK BUFFER ***
14500 Z$="":FOR I=1 TO N
   :GOSUB 14520
14510 Z$=Z$+A$:NEXT:RETURN
14520 GET#3,A$:IF A$="" THEN
   A$=CHR$(0)
14530 A=ASC(A$):BP=BP+1
   :RETURN
14999 REM *** PRINT EDITOR
    HEADER/FOOTER ***
15000 PRINT "[CLEAR,RVSON,
   BLUE,SPC12,RVSOFF,BLACK,
   SPC,SW,SO,SR,SD,SP,SR,SO,
   SK,SPC,SE,SD,SI,ST,SO,SR,
   SPC,RVSON,BLUE,SPC11]";NO$
15010 PRINT "[BLUE,DOWN20,
   RVSON,BLUE]";NO$;
15020 PRINT "[RVSON,SPC4,
   RVSOFF,BLACK,SC,ST,SR,SL,
   RVSON,BLUE,SPC,RVSOFF,
   BLACK,UP-ARROW,RVSON,BLUE,
   SPC]FOR[SPC,SH,SE,SL,SP,
   SPC2,RVSOFF,BLACK,SC,ST,
   SR,SL,RVSON,BLUE,SPC,
   BLACK,RVSOFF,LEFT-ARROW,
   RVSON,BLUE,SPC]FOR[SPC,SM,
   SE,SN,SU,SPC3,HOME,DOWN2,
   BLACK,RVSOFF]";
15030 POKE 2023,160
   :POKE 56295,6:POKE 1944,
   177:POKE 56216,6
   :REM * LAST SQUARE
15040 RETURN
15999 REM *** SAVE CURRENT
    EDITOR COLOURS ***
16000 POKE 53248,PEEK(53280)
   :POKE 53249,PEEK(53281)
16010 POKE 53280,6
   :POKE 53281,1:PRINT CHR$(
   144):RETURN
16499 REM *** RETURN PREVIOU
   S COLOURS ***
16500 POKE 53280,PEEK(53248)
   :POKE 53281,PEEK(53249)
   :RETURN
17999 REM *** GET AND STORE
    FILENAME ***
18000 PRINT "[DOWN2,RIGHT23]
   123456789012"
18010 INPUT "[RIGHT5]GIVE
    FILENAME : ";FM$
18020 IF LEN(FM$)<1 OR LEN(F
   M$)>12 THEN 18000
18030 FM$=FM$+".TXT"
18040 POKE 832,LEN(FM$)
18050 FOR I=1 TO LEN(FM$)
   :FC$=MID$(FM$,I,1)
   :FC=ASC(FC$)
18060 IF FC$="*" OR FC$="?"
   OR (FC$="." AND I<>LEN(FM
   $)-3) THEN 18090
18070 POKE 832+I,FC:NEXT
18080 RETURN
18090 PRINT "[DOWN,RIGHT5]
   INVALID FILENAME!!"
   :GOTO 18000
```

PROGRAMMER OF THE YEAR

commodore

Polar problems with this month's entry from Ian Potts.

POLAR PETE IS THE LATEST GAME TO BE featured in the Programmer of the Year competition. The game doesn't feature really fast, super smooth graphics, but instead Ian Potts has taken a simple idea, added some extremely 'cute' graphics and produced an excellent game. A good game isn't always complicated.

The Game

Your aim is to guide Polar Pete around his local ice-pack collecting the blocks of ice so that he can build his igloo. Of course life isn't made easy as Pete has to avoid the penguins and polar bears which always seem to be in his way.

Pete is controlled by a joystick in Port 2. To pick up a block of ice you must position Pete just to the right of a block of ice and press the button. Positioning is important and it has been found that it is best to position Pete so that his nose is just above and right of the ice block.

Once the ice block is collected Pete must drag the block back to his pad on the right hand side of the screen. Again position Pete to the right and press fire to deposit the block.

After all of the blocks have been collected Pete will build his igloo and go on to the next screen.

The music can be turned off by pressing any key on the keyboard.

Oh, by the way, don't let Pete fall into the water as it's very cold!

Getting It In

Polar Pete will work on a C64 with either tape or disk.

There are five parts to be entered (PETE LOAD 1-5). Each of the five parts must be typed into your machine separately and saved on to tape or disk. If you are using tape do make sure that the you make changes where indicated in the REM statements. Do make sure that you save the programs with the same names as in the magazine or they will not work.

Once all parts have been saved turn your machine off and on and enter the following line:

POKE 16483,0:POKE44,64:NEW

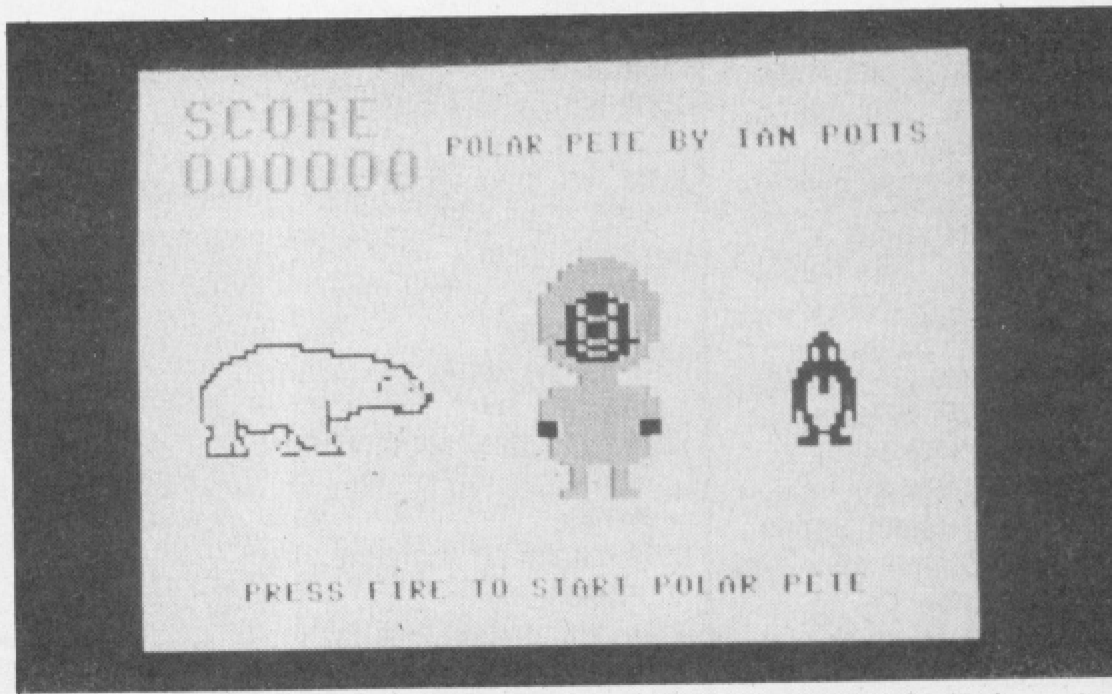
Now load 'PETE LOAD 1' into your machine and type RUN. This will load in each of the parts as required and save them into memory. If you have made any errors while typing in any of the data statements you will now be told which line the error is in. Make the changes needed, SAVE the part again and start again from the POKE instructions above.

When all of the information has been saved into memory the program will automatically save itself as 'POLAR PETE'. If you are using cassette then do make sure that you put a clean cassette into the recorder after part five has loaded. If you don't then 'POLAR PETE' will be saved after all of the other parts which are no longer needed.

All you need to do to play POLAR PETE is turn your machine off and on and type

LOAD "POLAR PETE",8,1 fo disk or
LOAD "POLAR PETE',1,1 for tape

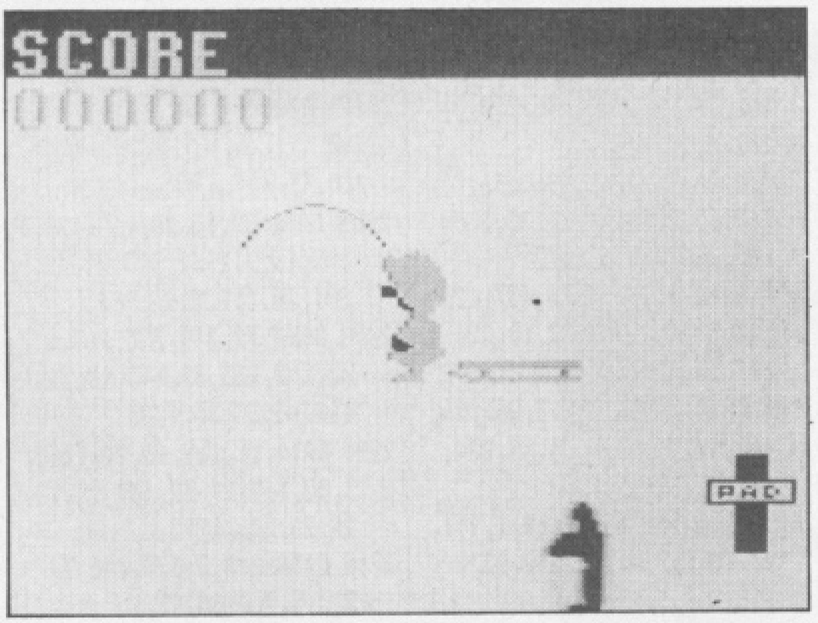
Once the program has finished loading type RUN and play the game.



PROGRAM: PETE LOAD 1

```
2000 FOR L=0 TO 156:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 2049+L*16+D,
   A:NEXT D
2010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2040+(L*10):STOP
2020 NEXT L
2040 DATA 13,8,10,0,158,40,
   50,56,49,54,41,0,0,0,234,
   234,947
2050 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2060 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2070 DATA 234,234,234,32,61,
   8,32,179,8,76,55,8,169,0,
   141,0,1471
2080 DATA 0,0,0,0,0,0,0,31,0,
   31,240,0,240,0,7,128,677
2090 DATA 0,12,0,0,24,192,0,
   32,32,0,40,32,0,192,0,0,
   556
2100 DATA 192,0,8,99,254,8,
   63,3,136,0,0,248,0,0,8,0,
   1019
2110 DATA 0,8,0,0,16,0,0,16,
   0,0,33,0,0,126,0,0,199
```

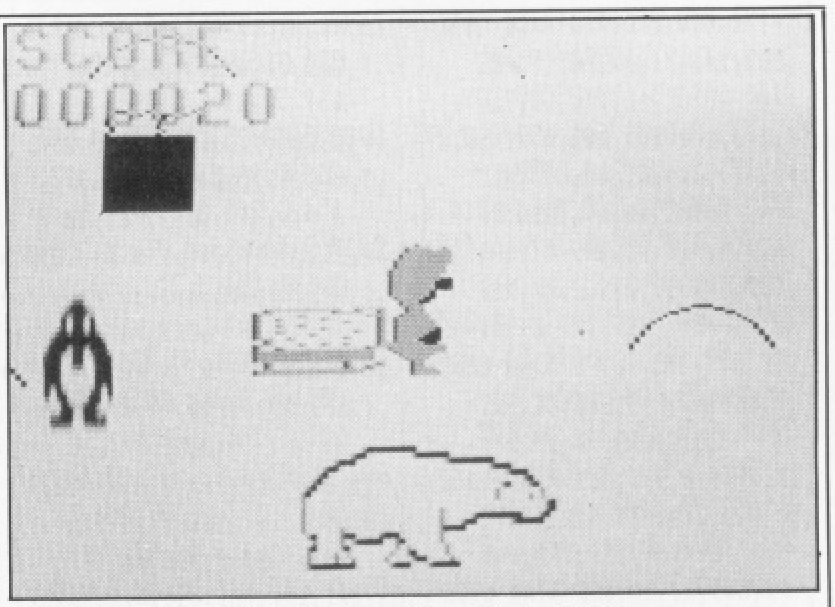
```
2120 DATA 0,0,127,224,0,192,56,0,0,15,0,0,1,192,0,0,807
2130 DATA 96,0,0,48,0,0,24,0,0,12,0,0,4,0,0,4,188
2140 DATA 0,0,4,0,0,4,0,0,4,0,2,4,15,14,24,25,96
2150 DATA 250,16,40,6,24,100,5,8,194,9,8,60,15,248,0,0,983
2160 DATA 0,0,0,0,0,0,0,31,0,31,240,0,240,0,7,128,677
2170 DATA 0,12,0,0,24,192,0,32,32,0,40,32,0,192,0,0,556
2180 DATA 192,0,8,99,254,8,63,3,136,0,0,252,0,0,12,0,1027
2190 DATA 0,4,0,0,12,0,0,22,0,0,18,0,0,63,0,0,119
2200 DATA 0,0,127,224,0,192,56,0,0,15,0,0,1,192,0,0,807
2210 DATA 96,0,0,48,0,0,24,0,0,12,0,0,4,0,0,4,188
2220 DATA 0,0,4,0,0,4,0,0,4,0,0,8,31,12,16,33,112
2230 DATA 250,16,32,2,32,16,4,48,16,4,72,240,15,248,0,0,995
2240 DATA 0,0,0,0,0,248,0,0,15,248,0,0,15,0,0,1,527
2250 DATA 224,0,0,48,0,3,24,0,4,4,0,4,20,0,0,3,334
2260 DATA 16,0,3,16,127,198,17,192,252,31,0,0,16,0,0,16,884
2270 DATA 0,0,8,0,0,8,0,0,132,0,0,126,0,0,0,0,274
2280 DATA 0,0,0,7,254,0,28,3,0,240,0,3,128,0,6,0,669
2290 DATA 0,12,0,0,24,0,0,48,0,0,32,0,0,32,0,0,148
2300 DATA 32,0,0,32,0,0,32,0,0,32,64,0,24,112,240,8,576
2310 DATA 95,152,24,96,20,16,160,38,16,144,67,31,240,60,0,0,1159
2320 DATA 0,0,0,0,0,248,0,0,15,248,0,0,15,0,0,1,527
2330 DATA 224,0,0,48,0,3,24,0,4,4,0,4,20,0,0,3,334
2340 DATA 16,0,3,16,127,198,17,192,252,63,0,0,48,0,0,32,964
2350 DATA 0,0,48,0,0,104,0,0,72,0,0,252,0,0,0,0,476
2360 DATA 0,0,0,7,254,0,28,3,0,240,0,3,128,0,6,0,669
2370 DATA 0,12,0,0,24,0,0,48,0,0,32,0,0,32,0,0,148
2380 DATA 32,0,0,32,0,0,32,0,0,16,0,0,8,48,248,8,424
2390 DATA 95,132,4,64,4,12,32,8,18,32,8,31,240,15,0,0,695
2400 DATA 0,0,0,168,0,2,170,0,2,170,0,10,168,128,10,168,996
2410 DATA 128,42,170,144,42,170,84,42,170,85,42,170,85,42,160,128,1704
2420 DATA 42,128,32,42,160,32,42,160,32,42,160,32,42,160,32,42,1180
2430 DATA 160,128,42,162,80,22,169,80,21,69,64,5,69,0,0,0,1071
2440 DATA 0,0,0,168,0,2,170,0,2,170,0,10,168,128,10,168,996
2450 DATA 128,42,170,144,42,170,84,42,170,85,42,170,85,42,160,128,1704
2460 DATA 42,128,32,42,160,32,42,160,32,42,160,32,42,160,32,42,1180
2470 DATA 160,128,42,162,0,6,169,64,5,85,64,5,69,0,0,0,959
2480 DATA 0,0,0,168,0,2,170,0,2,170,0,10,168,128,10,168,996
2490 DATA 128,42,170,144,42,170,84,42,170,85,42,170,85,42,160,128,1704
2500 DATA 42,128,32,42,160,32,42,160,32,42,160,32,42,160,32,42,1180
2510 DATA 160,128,42,162,0,10,168,0,1,85,64,1,85,64,234,169,1373
2520 DATA 0,141,92,3,141,93,3,141,94,3,141,95,3,141,96,3,1190
2530 DATA 169,8,32,210,255,169,0,141,24,3,169,11,141,25,3,76,1436
2540 DATA 65,13,169,1,141,25,208,141,18,208,141,26,208,169,0,141,1674
2550 DATA 52,3,141,56,3,141,14,220,141,53,3,169,20,141,54,3,1214
2560 DATA 141,55,3,141,17,208,120,169,84,141,20,3,169,11,141,21,1444
2570 DATA 3,88,96,169,1,141,25,208,169,40,141,18,208,173,54,3,1537
2580 DATA 141,22,208,173,55,3,141,17,208,32,215,20,173,56,3,240,1707
2590 DATA 16,173,232,3,208,3,76,45,13,169,0,141,232,3,76,244,1634
2600 DATA 12,169,1,141,56,3,173,53,3,208,3,76,160,11,201,1,1271
2610 DATA 208,3,76,219,11,201,2,208,3,76,22,12,76,81,12,173,1383
2620 DATA 52,3,240,3,32,252,20,173,54,3,56,237,52,3,201,16,1397
2630 DATA 144,6,141,54,3,76,49,234,105,8,141,54,3,169,1,141,1329
2640 DATA 232,3,162,0,202,208,253,238,156,3,24,165,253,105,1,133,2138
2650 DATA 253,165,254,105,0,133,254,76,137,12,173,52,3,240,3,32,1892
2660 DATA 80,21,173,54,3,24,109,52,3,201,24,176,6,141,54,3,1124
2670 DATA 76,49,234,233,8,141,54,3,169,1,141,232,3,162,0,202,1708
2680 DATA 208,253,206,156,3,56,165,253,233,1,133,253,165,254,233,0,2572
2690 DATA 133,254,76,137,12,173,52,3,240,3,32,18,22,173,55,3,1386
2700 DATA 56,237,52,3,201,16,144,6,141,55,3,76,49,234,105,8,1386
2710 DATA 141,55,3,169,1,141,232,3,162,0,202,208,253,238,157,3,1968
2720 DATA 24,165,253,105,120,133,253,165,254,105,0,133,254,76,137,12,2189
2730 DATA 173,52,3,240,3,32,61,22,173,55,3,24,109,52,3,201,1206
2740 DATA 24,176,6,141,55,3,76,49,234,233,8,141,55,3,169,1,1374
2750 DATA 141,232,3,162,0,202,208,253,206,157,3,56,165,253,233,120,2394
2760 DATA 133,253,165,254,233,0,133,254,165,253,133,249,165,254,133,250,3027
2770 DATA 162,0,160,0,177,249,157,0,4,232,200,192,40,208,245,24,2050
2780 DATA 165,249,105,120,133,249,165,250,105,0,133,250,224,240,208,226,2822
2790 DATA 162,0,160,0,177,249,157,240,4,232,200,192,40,208,245,24,2290
2800 DATA 165,249,105,120,133,249,165,250,105,0,133,250,224,240,208,226,2822
2810 DATA 162,0,160,0,177,249,157,224,5,232,200,192,40,208,245,24,2275
2820 DATA 165,249,105,120,133,249,165,250,105,0,133,250,224,240,208,226,2822
2830 DATA 76,49,234,24,165,253,105,112,133,249,165,254,105,8,133,250,2315
2840 DATA 162,0,160,0,177,249,157,208,6,232,200,192,40,208,245,24,2260
2850 DATA 165,249,105,120,133,249,165,250,105,0,133,250,224,240,208,226,2822
2860 DATA 160,0,177,249,153,192,7,200,192,40,208,246,32,214,22,32,2124
2870 DATA 214,22,32,168,24,32,144,26,169,0,141,56,3,76,49,234,1390
2880 DATA 32,78,28,169,128,141,18,212,32,113,28,32,201,28,169,154,1563
2890 DATA 32,210,255,169,147,32,210,255,32,145,18,32,160,19,32,35,1783
2900 DATA 11,169,16,141,248,3,32,167,27,32,137,25,32,20,26,206,1292
2910 DATA 248,3,173,248,3,240,3,76,160,13,169,16,141,248,3,165,1909
2920 DATA 203,201,64,240,26,173,86,27,208,13,169,15,141,24,212,169,1971
2930 DATA 1,141,86,27,76,160,13,169,0,141,24,212,141,86,27,173,1477
2940 DATA 0,220,41,4,208,19,169,1,141,53,3,169,2,141,52,3,1226
2950 DATA 32,12,15,32,205,15,76,23,14,173,0,220,41,8,208,19,1093
2960 DATA 169,2,141,52,3,169,0,141,53,3,32,78,15,32,15,
```




```
   16,921
2970 DATA 76,23,14,173,0,220,
   41,2,208,24,169,2,141,52,
   3,169,1317
2980 DATA 2,141,53,3,169,142,
   141,250,7,32,144,15,32,
   147,16,76,1370
2990 DATA 23,14,173,0,220,41,
   1,208,24,169,2,141,52,3,
   169,3,1243
3000 DATA 141,53,3,169,138,
   141,250,7,32,144,15,32,81,
   16,76,23,1321
3010 DATA 14,169,0,141,52,3,
   160,4,162,0,202,208,253,
   136,208,248,1960
3020 DATA 173,0,220,41,16,
   240,3,76,103,13,173,241,5,
   201,8,240,1753
3030 DATA 11,201,30,240,71,
   201,31,240,67,76,103,13,
   173,68,3,240,1768
3040 DATA 3,76,103,13,169,1,
   141,68,3,238,252,7,169,
   144,141,63,1591
3050 DATA 3,169,146,141,64,3,
   169,148,141,65,3,169,150,
   141,66,3,1581
3060 DATA 24,165,253,105,174,
   133,251,165,254,105,5,133,
   252,32,133,17,2201
3070 DATA 32,66,20,32,253,27,
   32,253,27,76,103,13,173,
   68,3,208,1386
3080 DATA 3,76,103,13,169,0,
   141,68,3,206,252,7,169,
   143,141,63,1557
3090 DATA 3,169,145,141,64,3,
   169,147,141,65,3,169,149,
   141,66,3,1578
3100 DATA 32,13,28,238,69,3,
   173,69,3,205,71,3,240,3,
   76,103,1329
3110 DATA 13,238,70,3,173,70,
   3,201,1,240,16,169,30,141,
   71,3,1442
3120 DATA 169,0,141,68,3,141,
   69,3,76,217,14,169,20,141,
   71,3,1305
3130 DATA 169,0,141,68,3,141,
   69,3,32,177,29,32,66,20,
   169,142,1261
3140 DATA 141,250,7,169,140,
   141,251,7,174,70,3,32,29,
   28,202,208,1852
3150 DATA 250,169,8,141,222,
   3,162,0,160,0,136,208,253,
   202,208,248,2370
3160 DATA 206,222,3,173,222,
   3,208,238,76,92,13,206,57,
   3,240,1,1963
3170 DATA 96,169,16,141,57,3,
   169,130,141,250,7,173,251,
   7,201,131,1942
3180 DATA 240,15,201,132,240,
   22,169,1,141,58,3,169,132,
   141,251,7,1922
3190 DATA 96,169,0,141,58,3,
   169,132,141,251,7,96,173,
   58,3,240,1737
3200 DATA 6,169,131,141,251,
   7,96,169,133,141,251,7,96,
   206,57,3,1864
3210 DATA 240,1,96,169,16,
   141,57,3,169,134,141,250,
   7,173,251,7,1855
3220 DATA 201,135,240,15,201,
   136,240,22,169,1,141,58,3,
   169,136,141,2008
3230 DATA 251,7,96,169,0,141,
   58,3,169,136,141,251,7,96,
   173,58,1756
3240 DATA 3,240,6,169,135,
   141,251,7,96,169,137,141,
   251,7,96,206,2055
3250 DATA 57,3,240,1,96,169,
   16,141,57,3,173,251,7,201,
   139,240,1794
3260 DATA 15,201,140,240,22,
   169,1,141,58,3,169,140,
   141,251,7,96,1794
3270 DATA 169,0,141,58,3,169,
   140,141,251,7,96,173,58,3,
   240,6,1655
3280 DATA 169,139,141,251,7,
   96,169,141,141,251,7,96,
   206,62,3,240,2119
3290 DATA 1,96,169,3,141,62,
   3,173,8,208,201,198,240,4,
   238,8,1753
3300 DATA 208,96,169,211,141,
   29,208,169,227,141,23,208,
   173,63,3,141,2210
3310 DATA 252,7,173,9,208,
   201,151,240,10,48,4,206,9,
   208,96,238,2060
3320 DATA 9,208,96,169,151,
   141,9,208,169,198,141,8,
   208,96,206,62,2079
3330 DATA 3,240,1,96,169,3,
   141,62,3,173,8,208,201,
   126,240,8,1682
3340 DATA 206,8,208,96,238,9,
   208,96,169,211,141,29,208,
   169,227,141,2364
3350 DATA 23,208,173,64,3,
   141,252,7,173,9,208,201,
   151,240,6,48,1907
3360 DATA 227,206,9,208,96,
   169,151,141,9,208,169,126,
   141,8,208,96,2172
3370 DATA 206,62,3,240,1,96,
   169,3,141,62,3,173,9,208,
   201,172,1749
3380 DATA 240,4,238,9,208,96,
   169,195,141,29,208,169,
   243,141,23,208,2321
3390 DATA 173,65,3,141,252,7,
   173,8,208,201,174,240,10,
   48,4,206,1913
3400 DATA 8,208,96,238,8,208,
   96,169,172,141,9,208,169,
   174,141,8,2053
3410 DATA 208,96,206,62,3,
   240,1,96,169,3,141,62,3,
   173,9,208,1680
3420 DATA 201,109,240,4,206,
   9,208,96,169,195,141,29,
   208,169,243,141,2368
3430 DATA 23,208,173,66,3,
   141,252,7,173,8,208,201,
   174,240,10,48,1935
3440 DATA 4,206,8,208,96,238,
   8,208,96,169,109,141,9,
   208,169,174,2051
3450 DATA 141,8,208,96,160,0,
   185,45,17,145,251,200,192,
   4,208,246,2106
3460 DATA 24,165,251,105,120,
   133,251,165,252,105,0,133,
   252,160,0,185,2301
3470 DATA 49,17,145,251,200,
   192,4,208,246,24,165,251,
   105,120,133,251,2361
3480 DATA 165,252,105,0,133,
   252,160,0,185,53,17,145,
   251,200,192,4,2114
3490 DATA 208,246,24,165,251,
   105,120,133,251,165,252,
   105,0,133,252,160,2570
3500 DATA 0,185,57,17,145,
   251,200,192,4,208,246,96,
   5,6,7,8,1627
3510 DATA 9,10,10,11,12,10,
   10,13,14,15,16,17,160,0,
   185,99,591
3520 DATA 17,145,251,200,192,
   7,208,246,24,165,251,105,
   120,133,251,165,2480
3530 DATA 252,105,0,133,252,
   160,0,185,106,17,145,251,
   200,192,7,208,2213
3540 DATA 246,96,0,19,20,21,
   22,23,0,18,0,0,0,0,0,24,
   489
3550 DATA 120,30,172,155,185,
   50,219,203,203,240,114,
   115,119,121,125,127,2298
3560 DATA 126,132,132,133,
   160,0,185,221,17,145,251,
   200,192,4,208,246,2352
3570 DATA 24,165,251,105,120,
   133,251,165,252,105,0,133,
   252,160,0,185,2301
3580 DATA 225,17,145,251,200,
   192,4,208,246,24,165,251,
   105,120,133,251,2537
3590 DATA 165,252,105,0,133,
   252,160,0,185,229,17,145,
   251,200,192,4,2290
3600 DATA 208,246,24,165,251,
   244,244,244,244,244,244,
   244,244,244,244,244,3578
4000 PRINT"[CLEAR]NEW"
   :PRINT"[DOWN2]
   LOAD"+CHR$(34)+"PETE LOAD
   2"+CHR$(34)+",8"
4010 REM ** CHANGE THE ,8
   IN ABOVE LINE TO ,1 IF
   YOU ARE USING TAPE **
4020 PRINT"[DOWN4]RUN"
4030 POKE 631,13:POKE 632,13
   :POKE 633,13:POKE 198,3
   :PRINT"[HOME]"
```

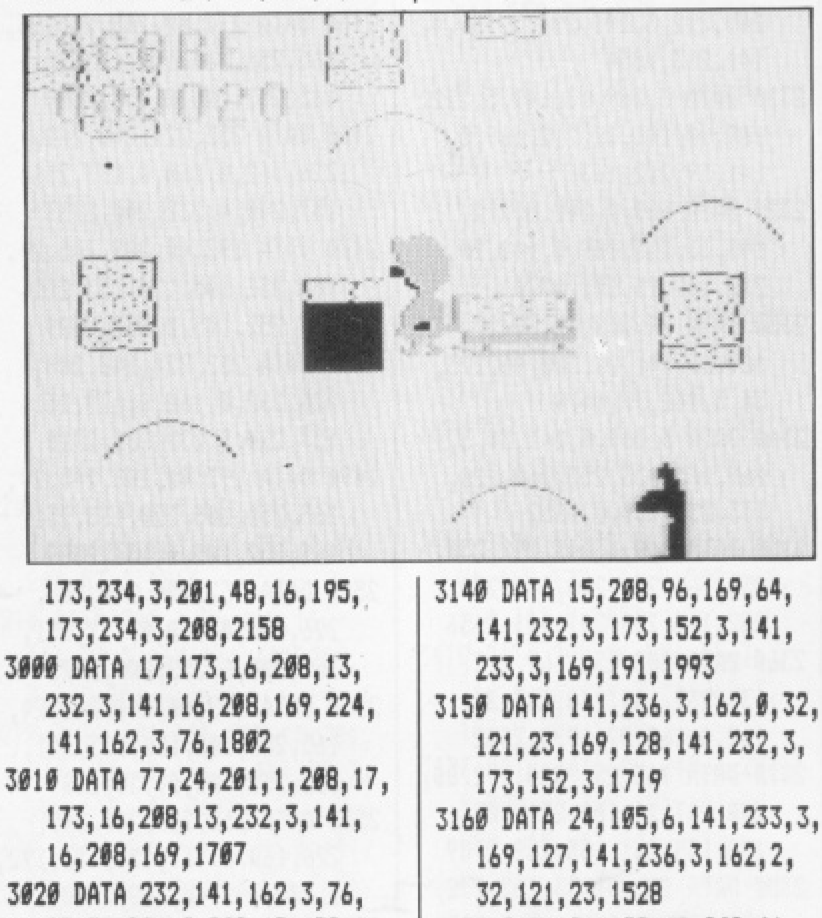
PROGRAM: PETE LOAD 2

```
2000 FOR L=0 TO 156:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 4549+L*16+D,
   A:NEXT D
2010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2040+(L*10):STOP
2020 NEXT L
2040 DATA 251,105,120,133,
   251,165,252,105,0,133,252,
   160,0,185,233,17,2362
2050 DATA 145,251,200,192,4,
   208,246,96,2,3,4,3,1,1,1,
   1,1358
2060 DATA 1,1,1,1,1,1,1,1,23,
   31,35,68,56,84,107,243,655
2070 DATA 112,4,187,252,90,
   94,54,67,86,118,156,145,
   138,32,36,36,1607
2080 DATA 39,165,228,226,126,
   113,113,113,113,117,118,
   117,116,122,122,123,2071
2090 DATA 129,131,132,132,
   133,120,126,124,128,128,
   115,123,123,123,113,120,
   2000
2100 DATA 124,132,124,130,
   160,0,185,129,18,145,251,
   200,192,4,208,246,2248
2110 DATA 24,165,251,105,120,
   133,251,165,252,105,0,133,
   252,160,0,185,2301
2120 DATA 133,18,145,251,200,
   192,4,208,246,24,165,251,
   105,120,133,251,2446
2130 DATA 165,252,105,0,133,
   252,160,0,185,137,18,145,
   251,200,192,4,2199
2140 DATA 208,246,24,165,251,
   105,120,133,251,165,252,
   105,0,133,252,160,2570
2150 DATA 0,185,141,18,145,
   251,200,192,4,208,246,96,
   0,30,31,0,1747
2160 DATA 32,33,34,35,0,30,
   31,0,0,30,31,0,169,174,
   141,4,744
2170 DATA 208,141,6,208,169,
   0,141,92,3,141,93,3,141,
   94,3,141,1584
2180 DATA 95,3,141,96,3,169,
   130,141,5,208,169,151,141,
   7,208,162,1829
2190 DATA 130,142,250,7,232,
   142,251,7,169,0,141,58,3,
   169,16,141,1858
2200 DATA 57,3,169,151,141,9,
   208,169,198,141,8,208,169,
   15,141,43,1830
2210 DATA 208,169,3,141,62,3,
   169,143,141,252,7,141,63,
   3,169,145,1819
2220 DATA 141,64,3,169,147,
   141,65,3,169,149,141,66,3,
   169,0,141,1571
2230 DATA 68,3,169,26,141,24,
   208,169,0,141,69,3,141,70,
   3,169,1404
2240 DATA 10,141,71,3,169,9,
   141,34,208,169,5,141,35,
   208,169,33,1546
2250 DATA 141,254,7,169,34,
   141,255,7,169,0,141,15,
   208,141,13,208,1903
2260 DATA 141,12,208,141,14,
   208,169,11,141,45,208,141,
   46,208,169,70,1932
2270 DATA 141,152,3,141,153,
   3,169,7,141,154,3,169,0,
   141,155,3,1535
2280 DATA 169,27,141,157,3,
   169,70,141,156,3,169,111,
   133,254,169,94,1966
2290 DATA 133,253,169,0,141,
   44,208,169,180,141,10,208,
   141,11,208,169,2185
2300 DATA 43,141,253,7,169,0,
   141,212,3,141,214,3,169,4,
   141,213,1854
2310 DATA 3,169,13,141,5,212,
   169,10,141,12,212,169,8,
   141,19,212,1636
2320 DATA 169,1,141,6,212,
   141,13,212,169,8,141,20,
   212,169,15,141,1770
2330 DATA 24,212,32,38,27,
   169,63,141,21,208,96,173,
   54,3,141,77,1479
2340 DATA 3,169,0,141,54,3,
   169,105,133,252,169,120,
   133,251,160,0,1862
2350 DATA 169,1,145,251,230,
   251,165,251,208,244,230,
   252,165,252,201,141,3156
2360 DATA 208,236,169,112,
   133,252,169,148,133,251,
   162,0,160,0,169,0,2302
2370 DATA 145,251,200,192,80,
   208,247,24,165,251,105,
   120,133,251,165,252,2789
2380 DATA 105,0,133,252,232,
   224,49,208,227,160,0,169,
   2,145,251,200,2357
2390 DATA 169,3,145,251,200,
   169,4,145,251,200,169,3,
   145,251,200,192,2497
```




```
2400 DATA 80,208,232,162,0,
   189,237,17,133,251,189,11,
   18,133,252,32,2144
2410 DATA 213,16,232,236,71,
   3,208,237,162,0,189,113,
   17,133,251,189,2270
2420 DATA 123,17,133,252,32,
   61,17,232,224,10,208,238,
   169,227,133,251,2327
2430 DATA 169,119,133,252,32,
   41,18,173,77,3,141,54,3,
   165,254,133,1767
2440 DATA 252,165,253,133,
   251,162,0,160,0,177,251,
   157,0,4,232,200,2397
2450 DATA 192,40,208,245,24,
   165,251,105,120,133,251,
   165,252,105,0,133,2389
2460 DATA 252,224,240,208,
   226,162,0,160,0,177,251,
   157,240,4,232,200,2733
2470 DATA 192,40,208,245,24,
   165,251,105,120,133,251,
   165,252,105,0,133,2389
2480 DATA 252,224,240,208,
   226,162,0,160,0,177,251,
   157,224,5,232,200,2718
2490 DATA 192,40,208,245,24,
   165,251,105,120,133,251,
   165,252,105,0,133,2389
2500 DATA 252,224,240,208,
   226,162,0,160,0,177,251,
   157,208,6,232,200,2703
2510 DATA 192,40,208,245,24,
   165,251,105,120,133,251,
   165,252,105,0,133,2389
2520 DATA 252,224,240,208,
   226,160,0,177,251,153,192,
   7,200,192,40,208,2730
2530 DATA 246,96,173,212,3,
   208,6,32,252,20,76,219,21,
   201,1,208,1974
2540 DATA 6,32,80,21,76,164,
   21,201,2,208,6,32,18,22,
   76,104,1069
2550 DATA 22,32,61,22,76,159,
   22,56,173,10,208,233,2,
   141,10,208,1435
2560 DATA 176,8,173,16,208,
   41,223,141,16,208,173,16,
   208,41,32,208,1888
2570 DATA 7,173,10,208,201,
   32,240,25,32,214,24,173,
   168,2,201,1,1711
2580 DATA 240,15,173,170,2,
   201,1,240,8,173,172,2,201,
   1,240,1,1840
2590 DATA 96,169,2,141,212,3,
   24,173,10,208,105,2,141,
   10,208,176,1680
2600 DATA 1,96,173,16,208,9,
   32,141,16,208,96,24,173,
   10,208,105,1516
2610 DATA 2,141,10,208,144,8,
   173,16,208,9,32,141,16,
   208,173,16,1505
2620 DATA 208,41,32,240,7,
   173,10,208,201,64,240,25,
   32,214,24,173,1892
2630 DATA 169,2,201,1,240,15,
   173,171,2,201,1,240,8,173,
   173,2,1772
2640 DATA 201,1,240,1,96,169,
   3,141,212,3,56,173,10,208,
   233,2,1749
2650 DATA 141,10,208,144,1,
   96,173,16,208,41,223,141,
   16,208,96,206,1928
2660 DATA 213,3,240,1,96,169,
   4,141,213,3,173,253,7,201,
   41,240,1998
2670 DATA 31,201,43,240,27,
   173,214,3,240,11,169,0,
   141,214,3,169,1879
2680 DATA 41,141,253,7,96,
   169,1,141,214,3,169,43,
   141,253,7,96,1775
2690 DATA 169,42,141,253,7,
```

```
96,206,213,3,240,1,96,169,
  4,141,213,1994
2700 DATA 3,173,253,7,201,
  157,240,31,201,159,240,27,
  173,214,3,240,2322
2710 DATA 11,169,0,141,214,3,
  169,157,141,253,7,96,169,
  1,141,214,1886
2720 DATA 3,169,159,141,253,
  7,96,169,158,141,253,7,96,
  206,11,208,2077
2730 DATA 206,11,208,173,11,
  208,201,48,240,18,32,214,
  24,173,168,2,1937
2740 DATA 201,1,240,8,173,
  169,2,201,1,240,1,96,169,
  1,141,212,1856
2750 DATA 3,238,11,208,238,
  11,208,96,238,11,208,238,
  11,208,173,11,2111
2760 DATA 208,201,210,240,18,
  32,214,24,173,170,2,201,1,
  240,8,173,2115
2770 DATA 171,2,201,1,240,1,
  96,169,0,141,212,3,206,11,
  208,206,1868
2780 DATA 11,208,96,206,213,
  3,240,1,96,169,4,141,213,
  3,173,253,2030
2790 DATA 7,201,154,240,31,
  201,156,240,27,173,214,3,
  240,11,169,0,2067
2800 DATA 141,214,3,169,154,
  141,253,7,96,169,1,141,
  214,3,169,156,2031
2810 DATA 141,253,7,96,169,
  155,141,253,7,96,206,213,
  3,240,1,96,2077
2820 DATA 169,4,141,213,3,
  173,253,7,201,151,240,31,
  201,153,240,27,2207
2830 DATA 173,214,3,240,11,
  169,0,141,214,3,169,151,
  141,253,7,96,1985
2840 DATA 169,1,141,214,3,
  169,153,141,253,7,96,169,
  152,141,253,7,2069
2850 DATA 96,173,155,3,208,3,
  76,225,22,76,45,23,206,
  154,3,173,1641
2860 DATA 154,3,201,255,240,
  3,76,5,23,169,7,141,154,3,
  206,152,1792
2870 DATA 3,173,152,3,201,53,
  240,3,76,5,23,169,1,141,
  155,3,1401
2880 DATA 206,202,3,240,1,96,
  169,20,141,202,3,173,254,
  7,201,33,1951
2890 DATA 208,11,169,35,141,
  254,7,169,36,141,255,7,96,
  169,33,141,1872
2900 DATA 254,7,169,34,141,
  255,7,96,238,154,3,173,
  154,3,201,8,1897
2910 DATA 240,3,76,81,23,169,
  0,141,154,3,238,152,3,173,
  152,3,1611
2920 DATA 201,85,240,3,76,81,
  23,169,0,141,155,3,206,
  202,3,240,1828
2930 DATA 1,96,169,20,141,
  202,3,173,255,7,201,37,
  208,11,169,40,1733
2940 DATA 141,254,7,169,39,
  141,255,7,96,169,38,141,
  254,7,169,37,1924
2950 DATA 141,255,7,96,173,
  156,3,205,233,3,16,3,76,
  142,23,173,1705
2960 DATA 21,208,45,236,3,
  141,21,208,96,173,21,208,
  13,232,3,141,1770
2970 DATA 21,208,173,233,3,
  56,237,156,3,141,234,3,
  173,54,3,41,1739
2980 DATA 7,24,109,154,3,141,
  192,3,201,8,48,9,56,233,8,
  141,1337
2990 DATA 192,3,238,234,3,
```




```
  173,234,3,201,48,16,195,
  173,234,3,208,2158
3000 DATA 17,173,16,208,13,
  232,3,141,16,208,169,224,
  141,162,3,76,1802
3010 DATA 77,24,201,1,208,17,
  173,16,208,13,232,3,141,
  16,208,169,1707
3020 DATA 232,141,162,3,76,
  77,24,201,2,208,17,173,16,
  208,13,232,1785
3030 DATA 3,141,16,208,169,
  240,141,162,3,76,77,24,
  173,234,3,201,1871
3040 DATA 35,16,37,173,234,3,
  56,233,3,141,234,3,240,11,
  172,234,1825
3050 DATA 3,169,0,24,105,8,
  136,208,250,141,162,3,173,
  16,208,45,1651
3060 DATA 236,3,141,16,208,
  76,77,24,173,234,3,56,233,
  35,141,234,1890
3070 DATA 3,172,234,3,169,0,
  24,105,8,136,208,250,141,
  162,3,173,1791
3080 DATA 16,208,13,232,3,
  141,16,208,173,162,3,24,
  109,192,3,141,1644
3090 DATA 162,3,157,12,208,
  173,157,3,205,153,3,16,3,
  76,111,24,1466
3100 DATA 173,21,208,45,236,
  3,141,21,208,96,173,21,
  208,13,232,3,1802
3110 DATA 141,21,208,173,153,
  3,56,237,157,3,141,234,3,
  173,234,3,1940
3120 DATA 201,31,16,220,173,
  234,3,56,233,1,141,234,3,
  169,0,172,1887
3130 DATA 234,3,24,105,8,136,
  208,250,24,109,55,3,141,
  13,208,141,1662
3140 DATA 15,208,96,169,64,
  141,232,3,173,152,3,141,
  233,3,169,191,1993
3150 DATA 141,236,3,162,0,32,
  121,23,169,128,141,232,3,
  173,152,3,1719
3160 DATA 24,105,6,141,233,3,
  169,127,141,236,3,162,2,
  32,121,23,1528
3170 DATA 96,173,16,208,41,
  32,208,23,173,10,208,56,
  233,24,162,0,1663
3180 DATA 56,233,8,144,4,232,
  76,229,24,142,188,2,76,9,
  25,173,1621
3190 DATA 10,208,162,0,56,
  233,8,144,4,232,76,249,24,
  138,24,105,1673
3200 DATA 28,141,188,2,173,
  11,208,56,233,50,162,0,56,
  233,8,144,1693
3210 DATA 4,232,76,17,25,142,
  189,2,169,0,133,187,169,4,
  133,188,1670
3220 DATA 174,189,2,240,16,
  165,187,24,105,40,133,187,
  165,188,105,0,1920
3230 DATA 133,188,202,208,
  240,24,165,187,109,188,2,
  133,187,165,188,105,2424
3240 DATA 0,133,188,160,0,
  177,187,141,168,2,200,200,
  177,187,141,169,2230
3250 DATA 2,24,165,187,105,
  240,133,187,165,188,105,0,
  133,188,177,187,2186
3260 DATA 141,171,2,136,136,
  177,187,141,170,2,56,165,
  187,233,120,133,2157
3270 DATA 187,165,188,233,0,
  133,188,177,187,141,172,2,
  200,200,177,187,2537
3280 DATA 141,173,2,96,173,
  30,208,141,102,3,41,8,208,
  1,96,173,1596
3290 DATA 102,3,41,32,208,53,
  173,102,3,41,192,208,80,
  96,169,142,1645
3300 DATA 141,250,7,169,140,
  141,251,7,169,0,141,52,3,
  141,86,27,1725
3310 DATA 32,128,26,206,5,
  208,173,5,208,240,13,160,
  4,162,0,202,1772
3320 DATA 208,253,136,208,
  248,76,184,25,76,115,26,
  173,16,208,41,32,2025
3330 DATA 240,1,96,173,11,
  208,201,110,16,1,96,201,
  170,48,1,96,1669
3340 DATA 173,10,208,201,160,
  16,1,96,201,200,48,178,96,
  173,16,208,1985
3350 DATA 41,64,240,1,96,173,
  13,208,201,110,16,1,96,
  201,170,48,1679
3360 DATA 1,96,173,12,208,
  201,110,16,1,96,201,200,
  48,144,96,173,1776
3370 DATA 67,6,201,1,240,13,
  201,2,240,9,201,3,240,5,
  201,4,1634
```

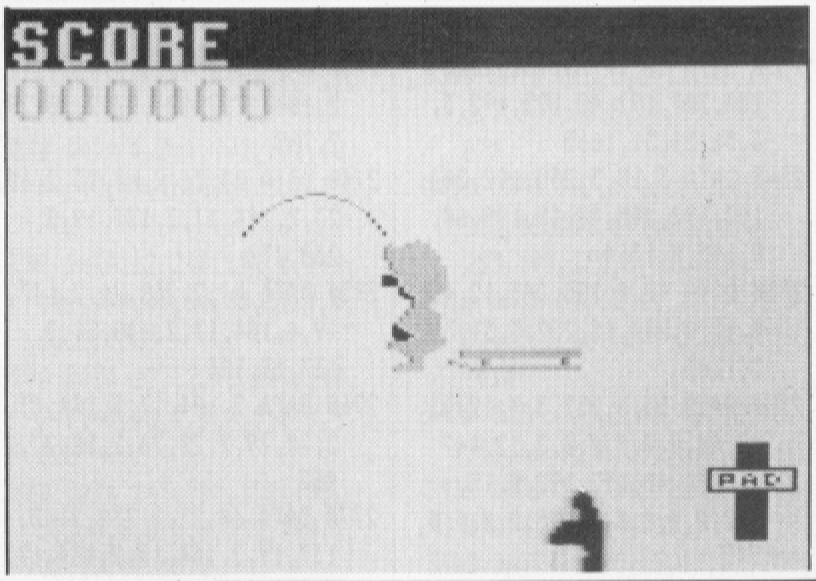
```
3380 DATA 240,1,96,169,0,141,
    52,3,173,53,3,208,13,169,
    187,141,1649
3390 DATA 4,208,169,150,141,
    5,208,76,97,26,201,1,208,
    13,169,158,1834
3400 DATA 141,4,208,169,151,
    141,5,208,76,97,26,201,2,
    208,8,169,1814
3410 DATA 170,141,5,208,76,
    97,26,169,144,141,5,208,
    169,231,141,21,1952
3420 DATA 208,169,142,141,
    250,7,169,0,141,86,27,32,
    128,26,160,0,1686
3430 DATA 162,0,202,208,253,
    136,208,248,76,65,13,169,
    59,141,15,212,2167
3440 DATA 169,190,141,16,212,
    169,17,141,18,212,96,173,
    86,27,208,1,1876
3450 DATA 96,206,107,27,240,
    1,96,173,90,27,141,107,27,
    169,2,141,1650
3460 DATA 106,27,174,106,27,
    189,87,27,240,57,222,100,
    27,208,52,189,1838
3470 DATA 97,27,41,254,188,
    103,27,153,4,212,138,10,
    170,32,29,27,1512
3480 DATA 240,39,172,106,27,
    153,100,27,185,103,27,168,
    32,29,27,153,1588
3490 DATA 0,212,32,29,27,153,
    1,212,174,106,27,189,97,
    27,9,1,1296
3500 DATA 153,4,212,206,106,
    27,16,186,96,32,108,27,
    189,91,27,149,1629
3510 DATA 217,189,92,27,149,
    218,161,217,208,200,181,
    217,208,2,214,218,2718
3520 DATA 214,217,169,255,
    172,106,27,153,100,27,185,
    103,27,168,169,0,2092
3530 DATA 153,0,212,153,1,
    212,240,203,246,217,208,2,
    246,218,161,217,2689
3540 DATA 96,169,0,141,86,27,
    162,2,138,10,168,56,185,
    91,27,233,1591
3550 DATA 1,153,217,0,185,92,
    27,233,0,153,218,0,202,16,
    233,169,1899
3560 DATA 1,141,100,27,141,
    101,27,141,102,27,141,107,
    27,141,86,27,1337
3570 DATA 96,0,1,1,1,3,112,
    41,45,43,64,31,16,32,128,
    0,614
3580 DATA 0,0,0,7,14,0,0,173,
    97,27,201,16,208,31,169,
    79,1022
3590 DATA 141,5,212,169,58,
    141,12,212,169,161,141,13
    212,169,64,141,2020
3600 DATA 97,27,169,15,141,
    244,244,244,244,244,244,
    244,244,244,244,244,3133
4000 PRINT"[CLEAR]NEW"
    :PRINT"[DOWN2]
    LOAD"+CHR$(34)+"PETE LOAD
    3"+CHR$(34)+",8"
4010 REM ** CHANGE THE ,8
    IN ABOVE LINE TO ,1 IF
    YOU ARE USING TAPE **
4020 PRINT"[DOWN4]RUN"
4030 POKE 631,13:POKE 632,13
    :POKE 633,13:POKE 198,3
    :PRINT"[HOME]"
```

PROGRAM: PETE LOAD 3

```
2000 FOR L=0 TO 156:CX=0
    :FOR D=0 TO 15:READ A
    :CX=CX+A:POKE 7049+L*16+D,
    A:NEXT D
2010 READ A:IF A<>CX THEN PR
    INT"ERROR IN LINE";
    2040+(L*10):STOP
2020 NEXT L
2040 DATA 141,3,212,169,32,
    41,2,212,96,169,13,141,5,
    212,169,10,1727
2050 DATA 141,12,212,169,1,
    141,13,212,169,16,141,97,
    27,96,174,92,1713
2060 DATA 3,189,218,29,133,
    122,169,41,133,123,162,27,
    32,237,27,174,1819
2070 DATA 93,3,189,218,29,
    133,122,162,28,32,237,27,
    174,94,3,189,1733
2080 DATA 218,29,133,122,162,
    29,32,237,27,174,95,3,189,
    218,29,133,1830
2090 DATA 122,162,91,32,237,
    27,174,96,3,189,218,29,
    133,122,162,92,1889
2100 DATA 32,237,27,96,160,0,
    177,122,157,0,32,232,232,
    232,200,192,2128
2110 DATA 7,208,243,96,238,
    96,3,173,96,3,201,10,240,
    1,96,169,1880
2120 DATA 0,141,96,3,238,95,
    3,173,95,3,201,10,240,1,
    96,169,1564
2130 DATA 0,141,95,3,238,94,
    3,173,94,3,201,10,240,1,
    96,169,1561
2140 DATA 0,141,94,3,238,93,
    3,173,93,3,201,10,240,1,
    96,169,1558
2150 DATA 0,141,93,3,238,92,
    3,173,92,3,201,10,240,1,
    96,169,1555
2160 DATA 0,141,92,3,96,169,
    1,141,25,208,141,18,208,
    141,26,208,1618
2170 DATA 120,169,102,141,20,
    3,169,28,141,21,3,88,96,
    169,1,141,1412
2180 DATA 25,208,141,18,208,
    76,49,234,169,1,141,33,
    208,169,0,141,1821
2190 DATA 32,208,169,255,141,
    21,208,169,223,141,29,208,
    169,239,141,23,2376
2200 DATA 208,169,60,141,1,
    208,141,3,208,169,40,141,
    0,208,169,88,1954
2210 DATA 141,2,208,169,15,
    141,39,208,141,40,208,169,
    15,141,41,208,1886
2220 DATA 141,42,208,169,60,
    141,28,208,169,10,141,37,
    208,169,9,141,1881
2230 DATA 38,208,169,20,141,
    24,208,162,128,142,248,7,
    232,142,249,7,2125
2240 DATA 169,31,32,210,255,
    169,147,32,210,255,169,27,
    141,17,208,169,2241
2250 DATA 8,141,22,208,173,
    97,27,41,254,141,97,27,
    173,98,27,41,1575
2260 DATA 254,141,98,27,173,
    99,27,41,254,141,99,27,
    169,0,141,6,1697
2270 DATA 212,141,13,212,141,
    20,212,169,142,141,250,7,
    169,140,141,251,2361
2280 DATA 7,169,180,141,4,
    208,141,6,208,169,115,141,
    5,208,169,157,2028
2290 DATA 141,7,208,169,32,
    141,16,208,169,0,141,44,
    208,169,152,141,1946
2300 DATA 253,7,169,20,141,
    10,208,169,140,141,11,208,
    169,0,141,8,1795
2310 DATA 208,141,9,208,169,
    128,141,248,7,169,129,141,
    249,7,162,37,2153
2320 DATA 142,255,7,232,142,
    254,7,169,44,141,12,208,
    169,92,141,14,2029
2330 DATA 208,169,140,141,13,
    208,141,15,208,169,11,141,
    45,208,141,46,2004
2340 DATA 208,32,167,27,24,
    160,15,162,3,32,240,255,
    162,0,189,228,1904
2350 DATA 29,32,210,255,232,
    224,23,208,245,24,160,5,
    162,22,32,240,2103
2360 DATA 255,162,0,189,251,
    29,32,210,255,232,224,30,
    208,245,173,0,2495
2370 DATA 220,41,16,208,249,
    169,0,141,17,208,141,16,
    208,169,211,141,2155
2380 DATA 29,208,169,227,141,
    23,208,96,169,176,133,251,
    169,114,133,252,2498
2390 DATA 162,0,160,0,189,25,
    30,145,251,232,200,192,17,
    208,245,165,2221
2400 DATA 251,24,105,120,133,
    251,165,252,105,0,133,252,
    224,170,208,226,2619
2410 DATA 96,32,39,46,53,60,
    67,74,81,88,95,80,79,76,
    65,82,1113
2420 DATA 32,80,69,84,69,32,
    66,89,32,73,65,78,32,80,
    79,84,1044
2430 DATA 84,83,80,82,69,83,
    83,32,70,73,82,69,32,84,
    79,32,1117
2440 DATA 83,84,65,82,84,32,
    80,79,76,65,82,32,80,69,
    84,69,1146
2450 DATA 0,0,0,0,0,0,0,0,0,
    255,146,147,0,0,0,0,548
2460 DATA 0,0,0,0,0,0,0,0,
    148,149,150,0,151,152,153,
    0,903
2470 DATA 0,0,0,0,0,0,0,0,
    154,155,156,157,158,159,
    160,161,1260
2480 DATA 162,0,0,0,0,0,0,0,
    163,164,165,166,167,168,
    169,170,1494
2490 DATA 171,172,173,0,0,0,
    0,0,0,174,175,176,177,178,
    179,180,1755
2500 DATA 181,182,183,184,0,
    0,185,186,187,188,189,190,
    191,192,193,194,2625
2510 DATA 195,196,197,198,
    199,200,201,202,203,204,
    205,206,207,208,209,210,
    3240
```

```
2520 DATA 211,212,213,214,
   215,216,217,218,219,220,
   221,222,223,224,225,226,
   3496
2530 DATA 227,228,229,230,
   231,232,233,234,0,0,0,0,
   235,236,237,238,2790
2540 DATA 239,240,241,242,
   243,244,245,246,247,0,0,0,
   0,0,0,0,2187
2550 DATA 248,249,250,251,
   252,253,254,0,0,0,0,0,0,
   234,234,234,2459
2560 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2570 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2580 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2590 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2600 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2610 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2620 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2630 DATA 234,234,234,234,
   234,234,234,254,0,0,2,0,0,
   64,0,0,1958
2640 DATA 2,140,58,2,41,52,1,
   120,46,1,120,46,2,41,52,2,
   726
2650 DATA 140,58,2,41,52,1,
   120,46,1,120,46,2,41,52,2,
   140,864
2660 DATA 58,2,41,52,1,120,
   46,1,120,46,2,41,52,2,140,
   58,782
2670 DATA 2,41,52,4,120,46,2,
   140,58,2,41,52,1,120,46,1,
   728
2680 DATA 120,46,2,41,52,2,
   140,58,2,41,52,1,120,46,1,
   120,844
2690 DATA 46,2,41,52,2,140,
   58,2,41,52,1,120,46,1,120,
   46,770
2700 DATA 2,41,52,2,140,58,2,
   41,52,4,120,46,0,0,255,0,
   815
2710 DATA 255,0,255,0,255,0,
   255,0,174,1,180,83,76,69,
   70,84,1757
2720 DATA 49,0,184,1,132,56,
   234,234,234,234,234,234,
   234,234,234,234,2762
2730 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2740 DATA 234,234,234,234,
   234,234,234,234,234,234,
   234,234,234,234,234,234,
   3744
2750 DATA 234,234,234,234,
   234,234,234,60,60,60,102,
   102,102,96,96,102,2418
2760 DATA 60,96,102,6,96,102,
   102,102,102,60,60,60,0,0,
   0,0,948
2770 DATA 0,0,60,60,60,102,
   102,102,102,102,102,102,
   102,102,102,102,1302
2780 DATA 102,102,102,102,60,
   60,60,0,0,0,0,0,0,0,0,
   588
2790 DATA 0,0,0,0,0,0,0,124,
   126,0,102,96,0,102,96,0,
   646
2800 DATA 124,120,0,102,96,0,
   102,96,0,102,126,0,0,0,0,
   0,868
2810 DATA 0,0,24,60,60,24,
   102,102,120,6,102,24,60,
   102,24,96,906
2820 DATA 102,24,96,102,126,
   126,60,0,0,0,0,0,0,0,0,
   636
2830 DATA 0,0,0,0,0,0,0,0,12,
   0,32,255,192,171,255,192,
   1109
2840 DATA 171,255,240,171,
   255,240,170,255,252,170,
   255,252,42,255,252,42,3277
2850 DATA 255,255,42,191,255,
   10,191,255,90,175,255,86,
   175,255,86,171,2747
2860 DATA 255,86,171,255,1,
   171,255,1,170,255,1,106,
   252,0,90,176,2245
2870 DATA 0,62,176,0,63,192,
   0,0,63,192,0,255,240,0,
   255,252,1750
2880 DATA 3,250,252,3,250,
   252,15,234,252.7.235.252.
   5,171,252,5,2438
2890 DATA 111,252,5,95,252,9,
   127,250,42,255,234,42,170,
   170,42,170,2226
2900 DATA 168,2,170,160,0,
   255,192,0,63,0,0,63,0,2,
   170,0,1245
2910 DATA 10,170,0,10,170,0,
   0,0,63,192,0,255,240,0,
   255,252,1617
2920 DATA 3,250,252,3,250,
   252,15,250,252,15,250,252,
   15,250,252,15,2576
2930 DATA 250,252,15,245,252,
   11,213,250,42,213,234,42,
   170,170,42,170,2571
2940 DATA 168,2,170,160,0,
   255,192,0,255,192,8,243,
   240,10,240,232,2367
2950 DATA 10,162,168,2,162,
   160,0,0,63,192,0,255,240,
   0,255,252,1921
2960 DATA 3,250,252,3,250,
   252,15,250,188,15,254,188,
   15,254,172,15,2376
2970 DATA 255,148,15,255,84,
   11,253,86,42,253,90,42,
   170,170,42,170,2086
2980 DATA 168,2,170,160,0,
   255,192,35,255,240,43,243,
   248,43,192,232,2478
2990 DATA 42,194,168,10,2,
   160,0,0,48,0,3,255,8,3,
   255,234,1382
3000 DATA 15,255,234,15,255,
   234,63,255,170,63,255,170,
   63,255,168,255,2725
3010 DATA 255,168,255,254,
   168,255,254,160,255,250,
   165,255,250,149,255,234,
   3582
3020 DATA 149,255,234,149,
   255,234,64,255,170,64,63,
   169,64,14,165,0,2304
3030 DATA 14,188,0,3,252,0,0,
   3,252,0,15,255,0,63,255,0,
   1300
3040 DATA 63,175,192,63,175,
   192,63,171,240,63,235,208,
   63,234,80,63,2280
3050 DATA 249,80,63,245,80,
   175,253,96,171,255,168,
   170,170,168,42,170,2555
3060 DATA 168,10,170,128,3,
   255,0,0,252,0,0,252,0,0,
   170,128,1536
3070 DATA 0,170,160,0,170,
   160,0,3,252,0,15,255,0,63,
   255,0,1503
3080 DATA 63,175,192,63,175,
   192,63,175,240,63,175,240,
   63,175,240,63,2357
3090 DATA 175,240,63,95,240,
   175,87,224,171,87,168,170,
   170,168,42,170,2445
3100 DATA 168,10,170,128,3,
   255,0,3,255,0,15,207,32,
   43,15,160,1464
3110 DATA 42,138,160,10,138,
   128,0,3,252,0,15,255,0,63,
   255,0,1459
3120 DATA 63,175,192,63,175,
   192,62,175,240,62,191,240,
   58,191,240,22,2341
3130 DATA 255,240,21,255,240,
   149,127,224,165,127,168,
   170,170,168,42,170,2691
3140 DATA 168,10,170,128,3,
   255,0,15,255,200,47,207,
   232,43,3,232,1968
3150 DATA 42,131,168,10,128,
   160,0,0,40,0,2,190,128,10,
   255,160,1424
3160 DATA 11,255,224,43,255,
   232,47,255,248,175,255,
   250,175,255,250,175,3105
3170 DATA 255,250,175,255,
   250,175,255,250,175,255,
   250,175,255,250,175,255,
   3655
3180 DATA 250,175,255,250,43,
   255,232,43,255,232,42,255,
   168,10,190,160,2815
3190 DATA 2,170,128,0,170,0,
   0,0,255,0,43,255,232,43,
   255,232,1785
3200 DATA 175,255,250,175,
   255,250,175,255,245,175,
   255,245,95,255,245,95,3400
3210 DATA 255,240,95,255,240,
   47,255,248,43,255,232,42,
   170,168,42,170,2757
3220 DATA 168,10,170,160,3,
   195,192,3,195,192,10,131,
   192,10,131,192,1954
3230 DATA 0,2,160,0,2,160,0,
   0,255,0,43,255,232,43,255,
   232,1639
3240 DATA 175,255,250,175,
   255,250,175,255,250,175,
   255,250,95,255,245,95,3410
3250 DATA 255,245,95,255,245,
   47,255,248,43,255,232,42,
   170,168,42,170,2767
3260 DATA 168,10,170,160,3,
   195,192,3,195,192,3,195,
   192,3,195,192,2068
3270 DATA 10,130,160,10,130,
   160,0,0,255,0,43,255,232,
   43,255,232,1915
```

```
3280 DATA 175,255,250,175,
   255,250,95,255,250,95,255,
   250,95,255,245,15,3170
3290 DATA 255,245,15,255,245,
   47,255,248,43,255,232,42,
   170,168,42,170,2687
3300 DATA 168,10,170,160,3,
   195,192,3,195,192,3,194,
   160,3,194,160,2002
3310 DATA 10,128,0,10,128,0,
   0,0,170,0,2,170,128,10,
   190,160,1106
3320 DATA 10,255,160,43,255,
   232,43,255,232,175,215,
   250,175,85,250,173,2808
3330 DATA 215,122,173,215,
   122,173,125,122,173,215,
   122,173,215,122,173,215,
   2675
3340 DATA 122,165,125,90,41,
   215,104,41,125,104,42,85,
   168,10,170,160,1767
3350 DATA 2,170,128,0,170,0,
   253,0,0,0,0,0,0,0,0,723
3360 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
3370 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
3380 DATA 0,63,255,255,63,
   255,255,63,255,255,131,0,
   12,163,0,12,2037
3390 DATA 42,170,170,10,170,
   170,0,168,170,168,138,128,
   10,160,2,2,1678
3400 DATA 128,32,34,130,0,2,
   128,2,34,128,32,2,136,0,
   34,128,950
3410 DATA 8,2,130,0,138,128,
   0,8,130,34,10,160,0,34,42,
   170,994
3420 DATA 170,63,255,255,63,
   255,255,63,255,255,131,0,
   12,163,0,12,2207
3430 DATA 42,170,170,10,170,
   170,0,0,0,0,0,0,0,0,0,0,
   732
3440 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
3450 DATA 0,0,0,0,0,0,0,0,0,
   0,0,0,0,0,0,0,0
3460 DATA 0,255,255,252,255,
   255,252,255,255,252,48,0,
   194,48,0,202,2778
3470 DATA 170,170,168,170,
   170,160,0,42,170,42,160,2,
   162,128,128,10,1852
3480 DATA 136,8,2,128,0,130,
   136,128,2,128,8,2,136,0,
   34,128,1106
3490 DATA 32,2,162,0,130,32,
```




```
   0,2,160,136,130,136,0,10,
   170,170,1272
3500 DATA 168,255,255,252,
   255,255,252,255,255,252,
   48,0,194,48,0,202,2946
3510 DATA 170,170,168,170,
   170,160,0,128,0,2,128,0,2,
   143,255,242,1908
3520 DATA 191,255,254,143,
   255,254,143,255,242,143,
   255,242,143,255,242,143,
   3415
3530 DATA 255,242,143,255,
   242,143,255,242,143,255,
   242,143,255,242,143,255,
   3455
3540 DATA 242,143,255,242,
   143,255,242,143,255,242,
   143,255,242,191,255,254,
   3502
3550 DÀTA 191,255,254,143,
   255,242,0,128,0,2,142,170,
   162,138,0,34,2116
3560 DATA 186,32,46,136,2,46,
   136,128,34,136,0,34,136,
   32,162,136,1382
3570 DATA 8,34,138,128,34,
   142,0,34,138,0,162,138,34,
   34,136,0,1160
3580 DATA 34,136,34,34,138,0,
   34,136,32,162,136,0,34,
   184,136,46,1276
3590 DATA 184,0,174,138,170,
   178,0,143,255,242,191,255,
   254,191,255,254,2884
3600 DATA 143,255,242,143,
   255,244,244,244,244,244,
   244,244,244,244,244,244,
   3722
4000 PRINT"[CLEAR]NEW"
   :PRINT"[DOWN2]
   LOAD"+CHR$(34)+"PETE LOAD
    4"+CHR$(34)+",8"
4010 REM ** CHANGE THE ,8
   IN ABOVE LINE TO ,1 IF
   YOU ARE USING TAPE **
4020 PRINT"[DOWN4]RUN"
4030 POKE 631,13:POKE 632,13
   :POKE 633,13:POKE 198,3
   :PRINT"[HOME]"
```

PROGRAM: PETE LOAD 4

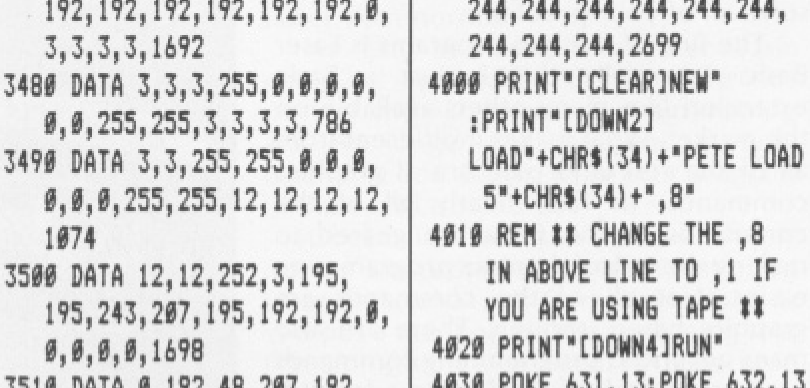
```
2000 FOR L=0 TO 156:CX=0
   :FOR D=0 TO 15:READ A
   :CX=CX+A:POKE 9549+L*16+D,
   A:NEXT D
2010 READ A:IF A<>CX THEN PR
   INT"ERROR IN LINE";
   2040+(L*10):STOP
2020 NEXT L
2040 DATA 255,242,143,255,
   242,143,255,242,143,255,
   242,143,255,242,143,255,
   3455
2050 DATA 242,143,255,242,
   143,255,242,143,255,242,
   143,255,242,143,255,242,
   3442
2060 DATA 143,255,242,143,
   255,254,191,255,254,143,
   255,242,128,0,2,128,2890
2070 DATA 0,2,0,138,170,178,
   184,0,174,184,136,46,136,
   0,34,136,1518
2080 DATA 32,162,138,0,34,
   136,34,34,136,0,34,138,34,
   34,138,0,1084
2090 DATA 162,142,0,34,138,
   128,34,136,8,34,136,32,
   162,136,0,34,1316
2100 DATA 136,128,34,136,2,
   46,186,32,46,138,0,34,142,
   170,162,128,1520
2110 DATA 0,2,234,0,0,0,0,40,
   0,0,170,0,2,170,128,2,748
2120 DATA 40,128,2,40,128,10,
   150,160,42,85,168,42,85,
   168,170,20,1438
2130 DATA 170,168,20,42,168,
   20,42,168,0,42,168,0,42,
   168,0,42,1260
2140 DATA 138,0,162,10,0,162,
   2,130,162,21,106,128,21,
   65,84,0,1191
2150 DATA 1,84,0,0,0,0,0,40,
   0,0,170,0,2,170,128,2,597
2160 DATA 40,128,2,40,128,10,
   150,160,42,85,168,42,85,
   168,170,20,1438
2170 DATA 170,168,20,42,168,
   20,42,168,0,42,168,0,42,
   168,0,42,1260
2180 DATA 138,0,162,138,0,
   162,2,130,160,2,170,128,
   21,65,84,21,1383
2190 DATA 65,84,0,0,0,0,0,40,
   0,0,170,0,2,170,128,2,661
2200 DATA 40,128,2,40,128,10,
   150,160,42,85,168,42,85,
   168,170,20,1438
2210 DATA 170,168,20,42,168,
   20,42,168,0,42,168,0,42,
   168,0,42,1260
2220 DATA 138,0,162,138,0,
   160,138,130,128,2,169,84,
   21,65,84,21,1440
2230 DATA 64,0,0,0,0,0,0,40,
   0,0,170,0,2,170,128,2,576
2240 DATA 170,128,2,170,128,
   10,170,160,42,170,168,42,
   170,168,170,170,2038
2250 DATA 170,170,170,170,
   170,170,170,170,170,170,
   170,170,170,170,170,170,
   2720
2260 DATA 138,170,162,10,170,
   162,2,170,162,21,106,128,
   21,65,84,0,1571
2270 DATA 1,84,0,0,0,0,0,40,
   0,0,170,0,2,170,128,2,597
2280 DATA 170,128,2,170,128,
   10,170,160,42,170,168,42,
   170,168,170,170,2038
2290 DATA 170,170,170,170,
   170,170,170,170,170,170,
   170,170,170,170,170,170,
   2720
2300 DATA 138,170,162,138,
   170,162,10,170,160,2,170,
   128,21,65,84,21,1771
2310 DATA 65,84,0,0,0,0,0,40,
   0,0,170,0,2,170,128,2,661
2320 DATA 170,128,2,170,128,
   10,170,160,42,170,168,42,
   170,168,170,170,2038
```

```
2330 DATA 170,170,170,170,170,170,170,170,170,170,170,170,170,170,170,170,2720
2340 DATA 138,170,162,138,170,160,138,170,128,2,169,84,21,65,84,21,1820
2350 DATA 64,0,0,0,0,0,0,42,0,0,170,128,0,170,128,2,704
2360 DATA 42,160,2,42,160,6,170,168,21,170,168,85,170,168,85,170,1787
2370 DATA 168,2,10,168,8,2,168,8,10,168,8,10,168,8,10,168,1084
2380 DATA 8,10,168,2,10,168,5,138,168,5,106,148,1,81,84,0,1102
2390 DATA 81,80,0,0,0,0,0,42,0,0,170,128,0,170,128,2,801
2400 DATA 42,160,2,42,160,6,170,168,21,170,168,85,170,168,85,170,1787
2410 DATA 168,2,10,168,8,2,168,8,10,168,8,10,168,8,10,168,1084
2420 DATA 8,10,168,2,10,168,0,138,168,1,106,144,1,85,80,0,1089
2430 DATA 81,80,0,0,0,0,0,42,0,0,170,128,0,170,128,2,801
2440 DATA 42,160,2,42,160,6,170,168,21,170,168,85,170,168,85,170,1787
2450 DATA 168,2,10,168,8,2,168,8,10,168,8,10,168,8,10,168,1084
2460 DATA 8,10,168,2,10,168,0,138,168,0,42,160,1,85,64,1,1025
2470 DATA 85,64,0,0,0,0,0,0,0,0,0,255,255,255,255,255,1424
2480 DATA 255,255,255,255,192,192,192,192,48,48,192,243,12,0,0,0,2331
2490 DATA 0,0,0,192,63,12,12,48,48,12,48,63,192,192,204,192,1278
2500 DATA 192,240,192,243,12,0,0,12,243,0,0,255,0,0,48,0,1437
2510 DATA 0,60,0,195,63,3,243,3,51,3,3,192,192,48,48,48,1152
2520 DATA 192,204,192,3,48,0,0,12,192,3,0,3,51,3,204,204,1311
2530 DATA 12,12,51,192,204,204,204,192,48,195,192,3,3,51,51,51,1665
2540 DATA 3,15,3,255,192,204,192,192,195,48,15,195,60,0,195,0,1764
2550 DATA 48,0,255,243,12,48,0,12,0,240,15,252,3,51,3,3,1185
2560 DATA 51,3,252,3,3,12,12,48,48,0,0,0,0,0,3,12,447
2570 DATA 48,192,192,0,15,240,0,0,0,0,0,255,0,0,0,0,942
2580 DATA 0,0,0,0,240,15,0,0,0,0,0,0,0,0,192,48,495
2590 DATA 12,3,3,192,192,48,48,12,12,0,0,234,234,234,234,234,1692
2600 DATA 234,234,234,234,234,234,234,234,234,234,234,234,234,234,234,234,3744
2610 DATA 234,234,234,234,234,234,234,234,234,234,234,234,234,234,234,234,3744
2620 DATA 234,234,234,21,21,21,21,21,21,21,21,84,84,84,84,84,1290
2630 DATA 84,84,84,255,192,207,204,207,204,192,255,255,0,195,204,207,2829
2640 DATA 12,0,255,255,0,15,204,204,207,0,255,255,3,3,195,195,2058
2650 DATA 3,3,255,60,102,102,102,102,102,60,24,24,120,24,24,24,1131
2660 DATA 126,60,102,6,60,96,96,126,60,102,6,28,6,102,60,12,1048
2670 DATA 28,60,108,126,12,12,126,96,124,6,6,102,60,60,102,96,1124
2680 DATA 124,102,102,60,126,6,6,12,24,24,24,60,102,102,60,102,1036
2690 DATA 102,60,60,102,102,62,6,102,60,234,234,234,234,234,234,234,2294
2700 DATA 234,234,234,2,238,21,2,137,19,2,104,17,2,104,17,2,1369
2710 DATA 70,29,2,20,26,2,60,23,2,60,23,2,238,21,2,137,717
2720 DATA 19,2,104,17,2,104,17,2,137,19,2,238,21,4,238,21,947
2730 DATA 2,238,21,2,137,19,2,104,17,2,104,17,2,70,29,2,768
2740 DATA 20,26,2,60,23,2,60,23,2,104,17,2,137,19,2,238,737
2750 DATA 21,2,238,21,2,137,19,6,104,17,2,238,21,2,137,19,986
2760 DATA 2,104,17,2,104,17,2,70,29,2,20,26,2,60,23,2,482
2770 DATA 60,23,2,238,21,2,137,19,2,104,17,2,104,17,2,137,887
2780 DATA 19,2,238,21,4,238,21,2,238,21,2,137,19,2,104,17,1085
2790 DATA 2,104,17,2,70,29,2,20,26,2,60,23,2,60,23,2,444
2800 DATA 104,17,2,137,19,2,238,21,2,238,21,2,137,19,6,104,1069
2810 DATA 17,2,238,21,2,60,23,2,20,26,2,20,26,2,70,29,560
2820 DATA 2,220,32,2,208,34,2,208,34,2,238,21,2,60,23,2,1090
2830 DATA 20,26,2,20,26,2,137,19,2,238,21,4,238,21,2,238,1016
2840 DATA 21,2,60,23,2,20,26,2,20,26,2,70,29,2,220,32,557
2850 DATA 2,208,34,2,208,34,2,104,17,2,110,16,2,163,14,2,920
2860 DATA 163,14,2,137,19,2,138,19,4,104,17,2,238,21,2,60,942
2870 DATA 23,2,20,26,2,20,26,2,70,29,2,220,32,2,208,34,718
2880 DATA 2,208,34,2,238,21,2,60,23,2,20,26,2,20,26,2,688
2890 DATA 137,19,2,238,21,4,238,21,2,238,21,2,60,23,2,20,1048
2900 DATA 26,2,20,26,2,70,29,2,220,32,2,208,34,2,208,34,917
2910 DATA 2,104,17,2,110,16,2,163,14,2,163,14,2,137,19,2,769
2920 DATA 138,19,4,104,17,2,238,21,2,137,19,2,104,17,2,104,930
2930 DATA 17,2,70,29,2,20,26,2,60,23,2,60,23,2,238,21,597
2940 DATA 2,137,19,2,104,17,2,104,17,2,137,19,2,238,21,4,827
2950 DATA 238,21,2,238,21,2,137,19,2,104,17,2,104,17,2,70,996
2960 DATA 29,2,20,26,2,60,23,2,60,23,2,104,17,2,137,19,528
2970 DATA 2,238,21,2,238,21,2,137,19,6,104,17,64,0,0,0,871
2980 DATA 4,238,21,2,104,17,2,104,17,4,70,29,2,60,23,2,699
2990 DATA 60,23,4,238,21,2,104,17,2,104,17,4,137,19,4,238,994
3000 DATA 21,4,238,21,2,104,17,2,104,17,4,70,29,2,60,23,718
3010 DATA 2,60,23,4,104,17,2,238,21,4,238,21,6,104,17,4,865
3020 DATA 238,21,2,104,17,2,104,17,4,70,29,2,60,23,2,60,755
3030 DATA 23,4,238,21,2,104,17,2,104,17,4,137,19,4,238,21,955
3040 DATA 4,238,21,2,104,17,2,104,17,4,70,29,2,60,23,2,699
3050 DATA 60,23,4,104,17,2,238,21,4,238,21,6,104,17,4,238,1101
3060 DATA 21,2,104,17,2,104,17,4,70,29,2,60,23,2,60,23,540
3070 DATA 4,238,21,2,104,17,2,104,17,4,137,19,4,238,21,4,936
3080 DATA 238,21,2,104,17,2,104,17,4,70,29,2,60,23,2,60,755
3090 DATA 23,4,104,17,2,238,21,4,238,21,2,138,19,4,104,17,956
3100 DATA 4,238,21,2,104,17,2,104,17,4,70,29,2,60,23,2,699
3110 DATA 60,23,4,238,21,2,104,17,2,104,17,4,137,19,4,238,994
3120 DATA 21,4,238,21,2,104,17,2,104,17,4,70,29,2,60,
```

```
    23,718
3130 DATA 2,60,23,4,104,17,2,
    238,21,4,238,21,2,138,19,
    4,897
3140 DATA 104,17,4,238,21,2,
    104,17,2,104,17,4,70,29,2,
    60,795
3150 DATA 23,2,60,23,4,238,
    21,2,104,17,2,104,17,4,
    137,19,777
3160 DATA 4,238,21,4,238,21,
    2,104,17,2,104,17,4,70,29,
    2,877
3170 DATA 60,23,2,60,23,4,
    104,17,2,238,21,4,238,21,
    6,104,927
3180 DATA 17,64,0,0,0,254,0,
    0,2,0,0,64,0,0,2,140,543
3190 DATA 58,2,41,52,1,120,
    46,1,120,46,2,41,52,2,140,
    58,782
3200 DATA 2,41,52,0,0,0,0,0,
    0,255,0,0,0,0,0,0,350
3210 DATA 0,192,63,0,0,0,3,
    15,60,60,204,15,48,192,0,
    0,852
3220 DATA 192,60,3,3,3,12,12,
    12,12,12,252,48,48,12,12,
    12,705
3230 DATA 12,12,15,240,12,3,
    0,0,3,60,192,0,0,0,192,
    240,981
3240 DATA 12,12,3,0,3,3,15,
    12,60,60,204,240,48,192,
    192,192,1248
3250 DATA 48,15,0,0,0,3,3,3,
    3,3,255,207,192,0,0,0,732
3260 DATA 0,0,0,255,12,12,12,
    12,12,12,12,240,0,0,0,0,
    579
3270 DATA 0,0,0,192,192,48,
    48,48,48,48,63,3,3,3,3,3,
    702
3280 DATA 12,240,192,0,192,
    192,240,48,60,60,51,0,0,3,
    3,12,1305
3290 DATA 12,12,48,204,240,
    240,48,15,0,0,0,0,0,3,3,3,
    828
3300 DATA 243,207,192,195,
    192,0,0,0,0,0,252,240,15,
    12,12,12,1572
3310 DATA 12,12,12,12,255,0,
    0,0,0,0,0,15,252,12,12,12,
    606
3320 DATA 12,12,12,192,0,0,0,
    0,0,0,63,192,192,48,48,48,
    819
3330 DATA 63,240,0,51,15,15,
    12,240,192,192,192,0,0,
    192,192,48,1644
3340 DATA 48,48,12,48,60,51,
    192,192,192,192,192,0,0,0,
    192,48,1467
3350 DATA 63,48,48,192,192,
    192,192,192,192,240,15,3,
    3,3,3,3,1581
3360 DATA 3,3,3,252,15,0,0,0,
    0,0,0,0,255,12,12,12,567
3370 DATA 12,12,12,15,240,0,
    0,0,0,0,0,240,48,48,48,48,
    723
3380 DATA 48,48,48,0,0,0,0,0,
    0,15,240,192,192,192,195,
    207,1377
3390 DATA 243,3,3,12,60,204,
    3,3,3,3,3,15,12,63,48,192,
    870
3400 DATA 192,192,192,255,0,
    255,48,192,192,192,192,
    255,192,255,3,12,2619
3410 DATA 12,12,12,255,3,255,
    3,3,3,3,3,192,192,48,15,3,
    1014
3420 DATA 3,3,3,48,48,48,48,
    240,48,15,0,3,3,3,3,3,519
3430 DATA 3,3,243,255,3,0,0,
    0,0,0,0,0,240,15,15,15,792
3440 DATA 15,15,15,12,12,255,
    255,255,255,255,255,0,15,
    252,252,252,2370
3450 DATA 252,252,252,63,192,
    0,0,0,0,0,0,48,48,48,48,
    48,1251
3460 DATA 48,48,63,3,3,3,3,3,
    12,240,192,3,3,12,240,48,
    924
3470 DATA 48,48,48,192,192,
    192,192,192,192,192,192,0,
    3,3,3,3,1692
3480 DATA 3,3,3,255,0,0,0,0,
    0,0,255,255,3,3,3,3,786
3490 DATA 3,3,255,255,0,0,0,
    0,0,0,255,255,12,12,12,12,
    1074
3500 DATA 12,12,252,3,195,
    195,243,207,195,192,192,0,
    0,0,0,0,1698
3510 DATA 0,192,48,207,192,
    192,192,192,192,192,192,0,
    252,3,3,3,2052
3520 DATA 3,3,3,15,15,255,15,
    0,0,0,0,255,255,255,255,
    12,1341
3530 DATA 12,12,12,252,252,
    255,240,0,0,0,0,0,63,240,
    48,48,1434
3540 DATA 48,48,48,240,0,0,0,
    0,0,0,0,192,192,192,192,
    192,1344
3550 DATA 192,195,207,48,51,
    51,60,48,192,0,0,240,192,
    192,192,192,2052
3560 DATA 192,192,192,3,3,3,
    3,3,3,3,3,0,0,0,0,0,600
3570 DATA 0,0,255,192,192,
    192,192,192,192,192,255,
    12,12,12,12,12,1914
3580 DATA 12,12,255,15,12,12,
    12,12,12,252,192,192,
    192,48,15,1257
3590 DATA 3,3,3,63,48,48,48,
    48,240,48,15,192,240,15,3,
    3,1020
3600 DATA 3,3,3,3,3,244,244,
    244,244,244,244,244,244,
    244,244,244,2699
4000 PRINT"[CLEAR]NEW"
    :PRINT"[DOWN2]
    LOAD"+CHR$(34)+"PETE LOAD
    5"+CHR$(34)+",8"
4010 REM ** CHANGE THE ,8
    IN ABOVE LINE TO ,1 IF
    YOU ARE USING TAPE **
4020 PRINT"[DOWN4]RUN"
4030 POKE 631,13:POKE 632,13
    :POKE 633,13:POKE 198,3
    :PRINT"[HOME]"
```

PROGRAM: PETE LOAD 5

```
2000 FOR L=0 TO 15:CX=0
    :FOR D=0 TO 15:READ A
    :CX=CX+A:POKE 12049+L*16+
    D,A:NEXT D
2010 READ A:IF A<>CX THEN PR
    INT"ERROR IN LINE";
    2040+(L*10):STOP
2020 NEXT L
2040 DATA 3,3,255,3,0,0,0,0,
    0,0,0,240,15,12,12,12,555
2050 DATA 12,12,12,12,255,0,
    0,0,0,0,0,15,252,12,12,48,
    642
2060 DATA 48,48,63,192,0,0,0,
    0,15,240,48,48,48,48,48,
    243,1089
2070 DATA 3,3,3,3,3,12,240,0,
    3,3,12,240,240,48,48,240,
    1101
2080 DATA 48,48,48,48,48,48,
    48,3,0,0,0,0,0,0,0,3,342
2090 DATA 195,195,51,15,0,0,
    0,0,0,0,0,0,192,48,15,243,
    954
2100 DATA 207,192,192,192,
    192,192,192,0,0,252,3,3,3,
    3,3,12,1638
2110 DATA 12,12,252,15,0,0,0,
    0,0,0,0,255,12,12,12,12,
    594
2120 DATA 12,12,15,240,0,0,0,
    0,0,63,240,48,48,48,48,63,
    837
2130 DATA 240,0,0,0,0,0,0,
    192,192,192,192,192,195,
    204,240,48,1887
2140 DATA 51,51,60,240,0,0,0,
    192,0,0,0,0,0,0,0,240,834
2150 DATA 15,0,0,0,0,0,0,3,3,
    255,3,0,0,0,0,0,279
2160 DATA 0,0,240,15,0,0,0,
    12,12,12,12,255,0,0,0,0,
    558
2170 DATA 0,0,15,240,0,0,0,
    48,48,63,192,0,0,0,0,15,
    621
2180 DATA 240,0,0,0,0,0,0,0,
    0,0,0,0,3,255,68,566
2190 DATA 255,255,255,0,0,0,
    0,40,0,0,170,0,2,170,128,
    2,1277
4000 POKE 43,1:POKE 44,8
    :POKE 45,5:POKE 46,48
4010 SAVE"POLAR PETE",8,1
4020 REM ** CHANGE THE ,8,1
    IN ABOVE LINE TO ,1,1
    IF YOU ARE USING TAPE
    **
```



LASER SHOW



Stuart Cooke has been experimenting with two Laser programs from Ocean.



HAVE YOU EVER WANTED TO WRITE your own arcade game but have been put off because of the complexities of machine code? Have you ever wished that the Basic on the C64 allowed you to do more with graphics? Or, have you always found it easy to write programs in Basic but always found them too slow? Well, two new packages from Ocean IQ will solve all of your problems.

The first of the two programs is Laser Basic. Essentially this is just a Basic extension like many others available on the market. What makes it different from all of the rest is its plethora of graphics commands. In fact, nearly all of the commands in this Basic are geared to making the task of graphics programming easier. Not all of the commands are graphics based, though. There are also many advanced programming commands such as procedures and quite a formidable array of 'toolkit' commands such as Renumber.

The second package is the one that will be of great interest to anyone who has found their latest version of Space Invaders just a little slow when written in Basic. The program is the Laser Compiler. The compiler will change standard Commodore Basic and Laser Basic programs into machine code. Obviously this will give any proprograms a significant increase in speed.

Laser Basic is an extension of an earlier program called Basic Lightning which has been around for some time. If you alread have Basic Lightning then you will be pleased to know that the Laser Compiler will compile most programs written with this package. But more of this later.

Laser Basic

As previously mentioned, this is essentially a Basic Extension, but a very powerful one. One very nice feature is the inclusion of a tape turbo save option. This will undoubtedly please cassette users who are totally fed up with the slowness of the Commodore cassette deck. In use the turbo proved itself to be both very fast and very reliable. Even trying turbo saved programs on different cassette recorders presented no problems.

Documentation

A large manual is supplied with the package which deals with all of the commands in detail. Some sections are a little difficult to understand at first reading but numerous example programs do make things a little clearer. Beginners would be well advised to try all examples and make sure that they understand how they work before they attempt to write any fantastic games program.

In Use

Programming with Laser Basic is a joy, though, when you get on to using graphics, it is a little complicated to understand at first. The numerous structured programming commands make the Basic great to use. If you've ever written programs in Pascal or other structured languages you'll know just how valuable are Procedures, Labels and other programming aids. For those who have never come across these commands let's take a closer look.

With a normal GOSUB statement in Basic you would use something like GOSUB 1000. Line 1000 could, for example, be the subroutine that updates the score. Unfortunately the line number 1000 doesn't tell you this. With Laser Basic you could re-write the GOSUB command like this:

```
GOSUB update
```

and line 1000 would become

```
1000 LABEL update:..........
```

This makes it much easier to follow the flow of a program.

Procedures take the use of labels much further. With a procedure it is possible to have a program that uses a

vaiable, for example VAR1. The procedure, which is similar to a subroutine can also use the same variable name however, the two can be treated as completely separate items the value of one not affecting the value of the other.

Other structured programming commands are REPEAT... UNTIL loops, IF..THEN..ELSE and WHILE..WEND. All of which lead to much clearer and easier programming.

Identity Crisis

Before we take a look at the graphics commands it is worth taking a close look at what is a new idea.

No doubt you will have already heard about the sprites that are available on the C64. In Laser Basic these have been renamed Hardware Sprites and a new type of sprite has been added, the Software Sprite. A software sprite, unlike a hardware sprite, is of dimensions that are set by the user up to a maximum of 255 character blocks by 255 character blocks.

All graphic commands are operated on Sprites, this may make you wonder how you get things on to the screen until you realise tht the hi-res screen is treated as sprite number zero with fixed dimensions and that the text screen is treated as sprite number 255 also with fixed dimensions.

A sprite designer package is included with Laser Basic, using this it is easy to design extremely large sprites.

Numerous commands are available for sprite drawing. It is possible to plot points on a sprite, draw boxes, draw lines. With the POLY command it is also possible to draw polygons and circles. Blank areas, such as those created with the BOX and POLY commands can be coloured in with the FILL command.

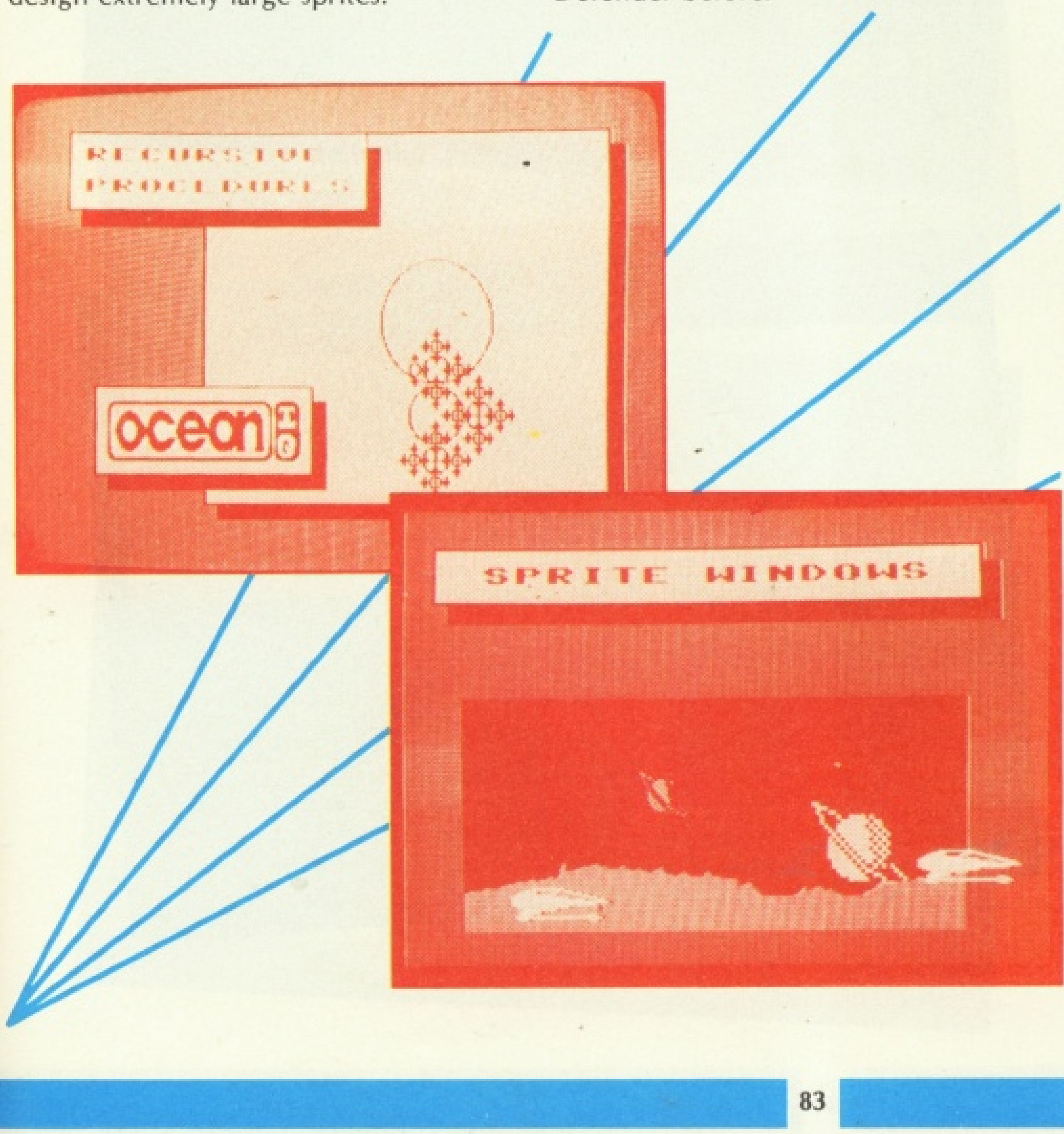
Moving it Around

Sprites can be manipulated in numerous ways. The PUTBLK command is used to place a sprite at a specific place on the hi-res screen. It is possible to OR, AND or XOR the sprite with whatever is already on the screen. With careful use of these commands the software sprites can be made to appear in front of, or behind, other items on the screen.

Commands also exist for copying sprites, or parts of sprites, into other sprites.

Commands exist for moving sprites around the screen and scrolling them. It is even possible to make a sprite follow the path of another.

Scrolling backdrops are now extremely easy. All that you need to do is to define your background as a sprite, don't forget that this can be up to 255 characters wide. Place this on the screen – only part of it will show – and then scroll the background sprite with one of the numerous scroll commands. It's as simple as that. It was never as easy as this to write Defender before.



And There's More

Obviously it is only possible to give a taste of some of the commands available. There are many that I haven't even mentioned. If you are interested in playing around with graphics or just interested in programming then you should rush out and buy a copy of the program. You should be creating works of art in no time at all.

Speeding Things Up

It's no good writing the world's best intergalactic space flight simulator only to find out that Brian the snail can beat your space ship at full speed. Nonetheless, that is exactly what will happen if you write your programs in Basic. The only way to write fast programs is to use machine code like all of the top programmers. Or is it?

The Laser Basic compiler will take programs that have been written using Laser Basic (and normal Basic) and turn them into machine code. Obviously the program generated by a compiler is not as compact or as fast as one written entirely in machine code but it will be many times faster than normal.

As can be seen, the Laser Basic compiler provides Commodore 64 owners with an excellent programming aid. No longer do you have to study machine code. Simply write your program in Basic and off you go.

Ocean IQ will also let you freely market any program that is written using Laser Basic and Laser Compiler as long as you put a mention on the packaging that these programs were used. Perhaps these packages could bring out the budding Minters and Crowthers in many people.

The Manual supplied with Laser Compiler is very small, only seven pages, but all necessary information is there. It explains how to compile a program including how to save it. A turbo option is included for tape users. Disk users shouldn't feel left out either as they are provided with a routine that will make programs auto start.

For the many users of Basic Lightening, a small section is included that explains the differences in some of the commands, though most of these are only minor. For example the CUTOFF command now uses numbers in the range zero to 65535 instead of zero to 2047.

A quick glance at the demo program supplied with these packages shows just what is possible with these two excellent programming tools. When the Basic version of the demo is run it is surprising enough what is being done from within Basic. But when you see the speed of the compiled version it looks even better.

If you want to get into graphics programming but don't fancy getting into machine code then take a look at both of these packages they are well worth it.

C16 ASSORTMENT

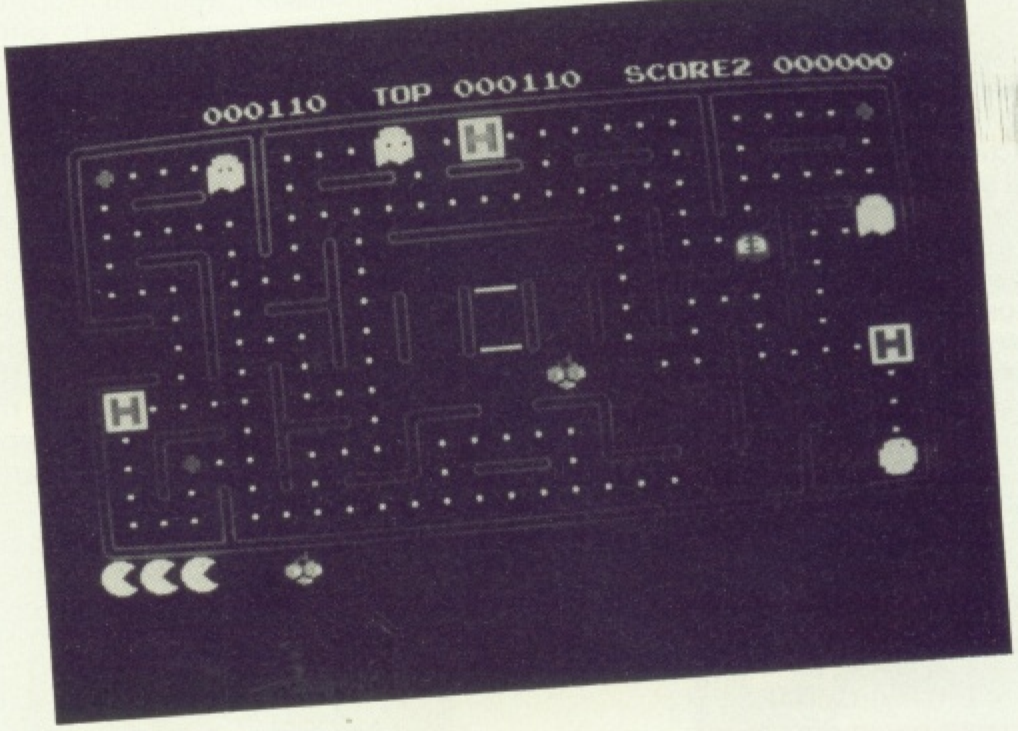
Eric Doyle guides you through some more C-16 games — new and not so new.

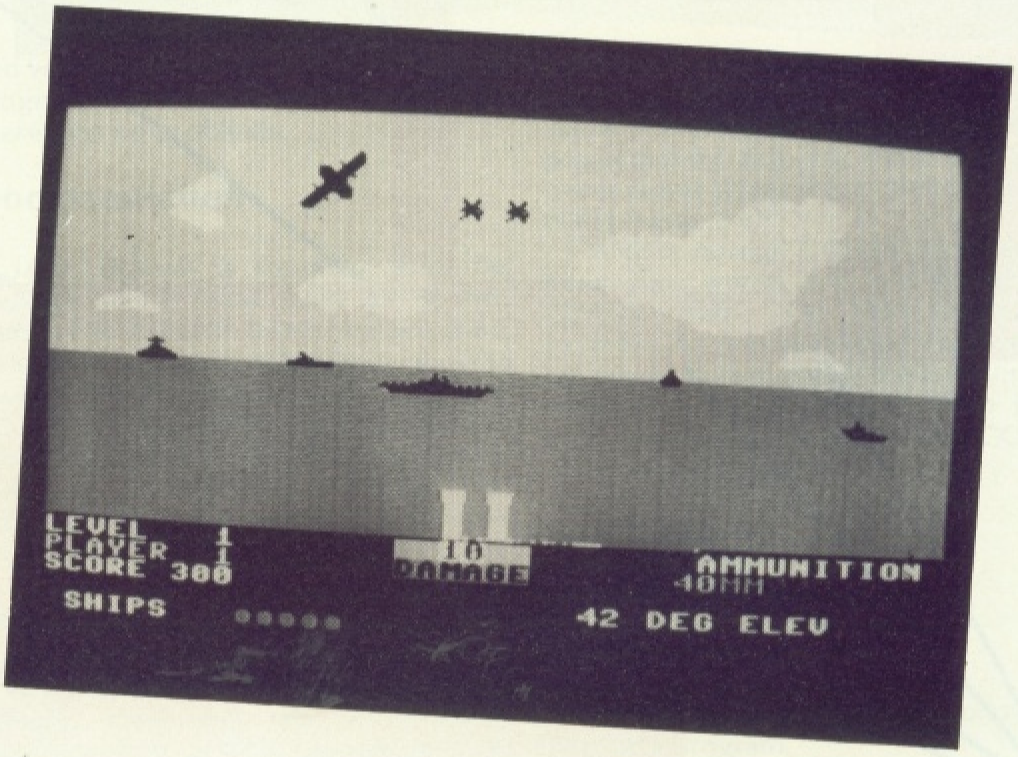
ANY PROGRAMMER WHO IS PLANNING a game for the C-16 always meets the problem of fitting the game into the limited memory space. This does not mean that the quality of the game will suffer, as Commodore proved with the 3.5K Vic 20. Unfortunately, the compression of and economical use of memory is not every software house's forte and the consequence is a plethora of unsatisfactory games. As I have shown there are several houses which take the C16 seriously and this month's collection shows the range of games which have impressed me and the reasons why.

Watching my colleagues in the office engrossed in yet another game of Breakout (and loving every minute) made me realise that complexity is not always the secret of a truly addictive game and to illustrate this I include Pacmania from Mr Chip Software. Pacman was one of the few arcade games to transcend the boundaries of the amusement arcade and capture public interest. The game is not very complex and even a satisfactory Basic game can be written or copied from a magazine. The added speed of machine code allows many more complications to be added and the animation is a lot smoother. Mr Chip has taken full advantage of these benefits to create a game which is recognisably the same as the arcade game, but different enough to give it added excitement.

Pacmania's hero is the familiar gobbling disc who is directed around a selection of eight mazes eating up all the dots that litter every passageway. Ghosts emanate from the centre of the maze and set off in hot pursuit of your little muncher. In most versions of this game that I have seen the ghosts quite often wander about aimlessly until they come within sight of Pacman, but not so in Pacmania. The ghosts in this game go straight for the jugular running like crazy after your slower moving little man. Relief from this relentless pursuit can only be gained by either using the hyper-maze ports or by eating power pills.

Hypersports are a bit of a gamble because you can never be sure where you will reappear after using them. Assuming you don't end up on top of another ghost, it is an effective way of escaping a hot pursuit but the power pills are more predictable because they mean that the ghosts become vulnerable for a while. This allows Pacman to gain more points by eating the ghosts or a safe period to eat the pills without any interference. The speed of the action increases as you work your way through each level of eight





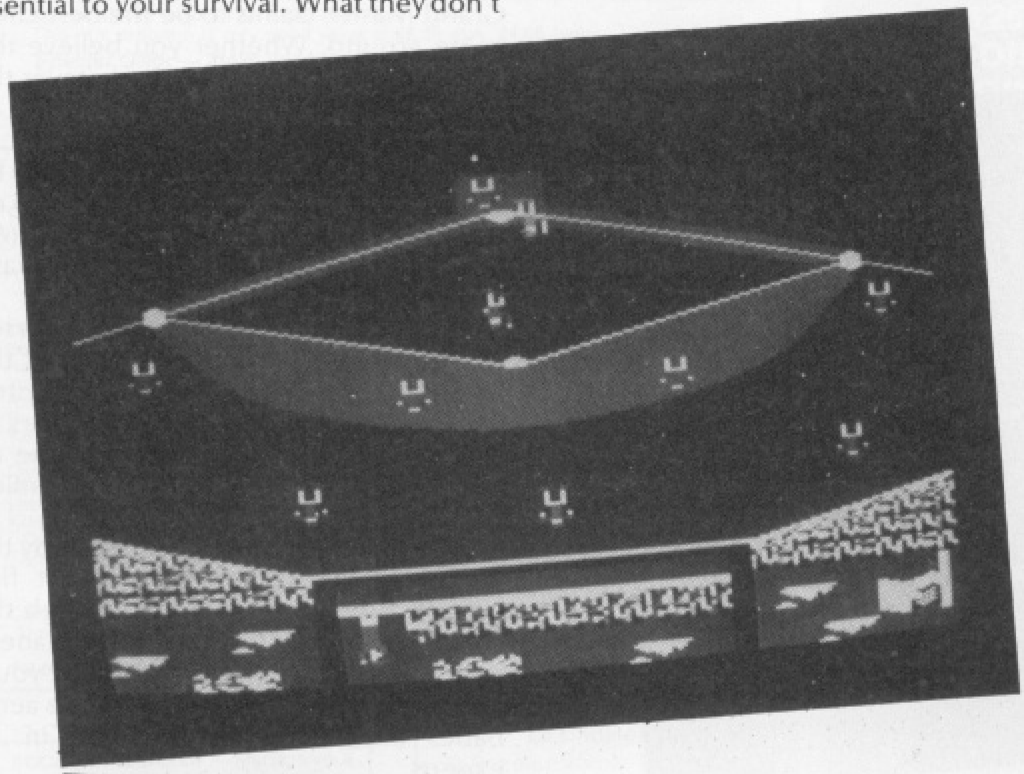
mazes, creating a game which can never be mastered fully and should hold the interest for quite some time.

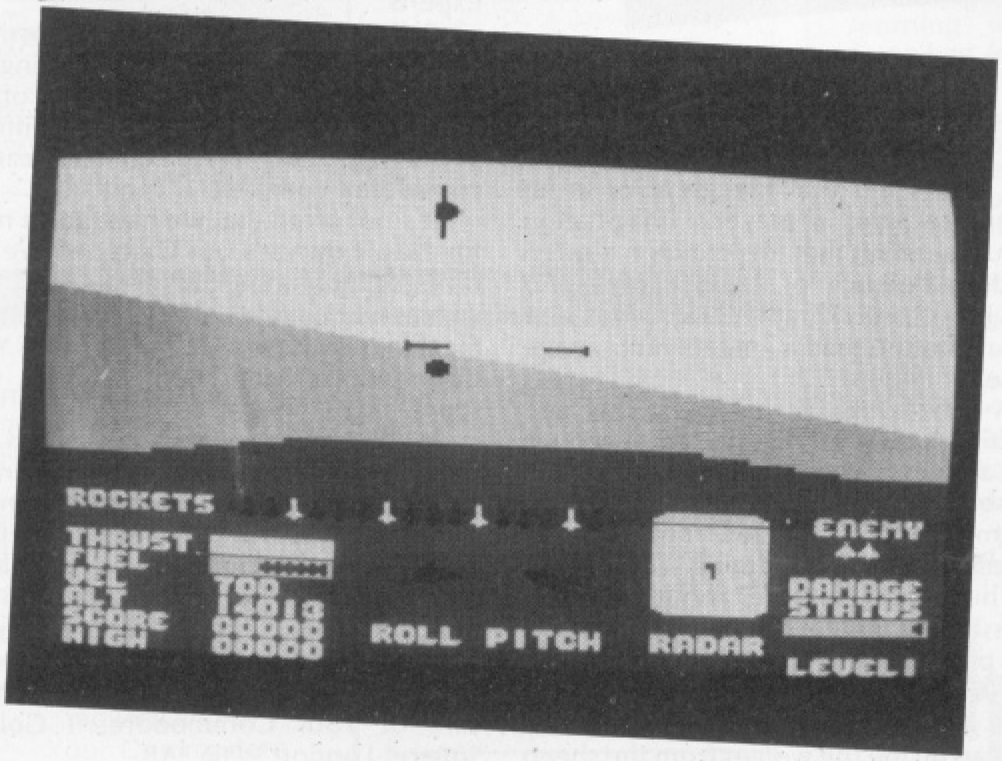
Cyborg on the Budgie budget priced label, from the Alligata pool of companies, is a simple game in programming terms but almost impossible to play unless you are the persevering type. Only ardent shoot 'em up fanatics should consider buying this one because it makes Pacman look like a senior citizen's picnic.

The rules are simple: blast all the moving aliens and save the diminutive Cyborgs before the enemy kills them. As always the reality is not so simple. In fact it took several attempts to start the first screen; every time my ship appeared an alien would collide with it and zap me back to the title screen minus another life. Eventually I managed to hang on long enough to survive and worry about using smart bombs. The instructions state that clearing the screen in one fell swoop is essential to your survival. What they don't tell you is how to detonate a smart bomb to achieve this but I found the space bar had the desired effect.

What happens is this, your ship appears and then a random number of aliens appear all over the screen and immediately home in on you. Praying as you grasp the fire button, you blast wildly and try to wipe them all out before another group appears. This goes on until you clear the first wave and then the next onslaught begins. Occasionally, several Cyborgs appear and you must collect as many as possible, avoiding all of the assorted enemy craft. Not much to the game really but it's maddeningly addictive.

Another game from Alligata should satisfy any platform game devotees with its 20 screens to puzzle over. Forward planning and exceptional hand to eye co-ordination are all that is required to complete Blagger.





Little by little, Roger the Dodger must learn the secrets of each room as he collects the golden keys which unlock the safes. Banks, shops and houses, nothing can stop a master thief but it could be a long apprenticeship.

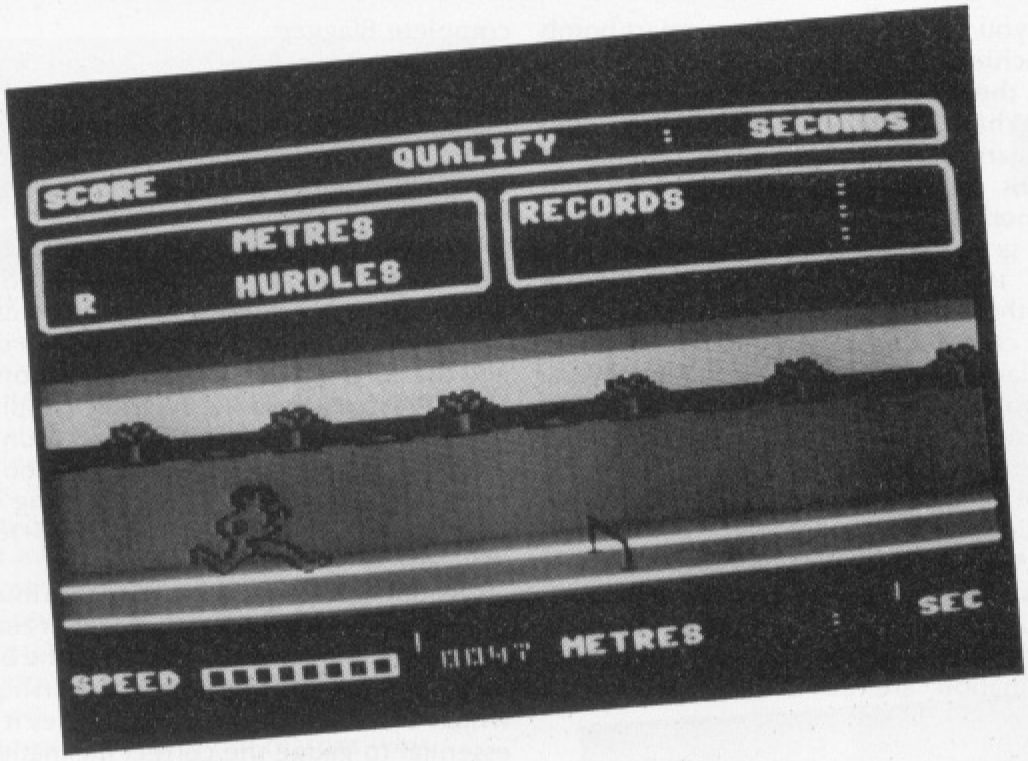
For the earthbound warrior there is US Gold's Beach head. The limited memory does not allow for all of the screens contained in the C64 version but you do get the aircraft attack, battleship bombardment and the final fortress. Despite the dubious claim to 'amazing sound' emblazoned on the cassette in bold capitals, the game displays something of what can be done with the C-16's graphics.

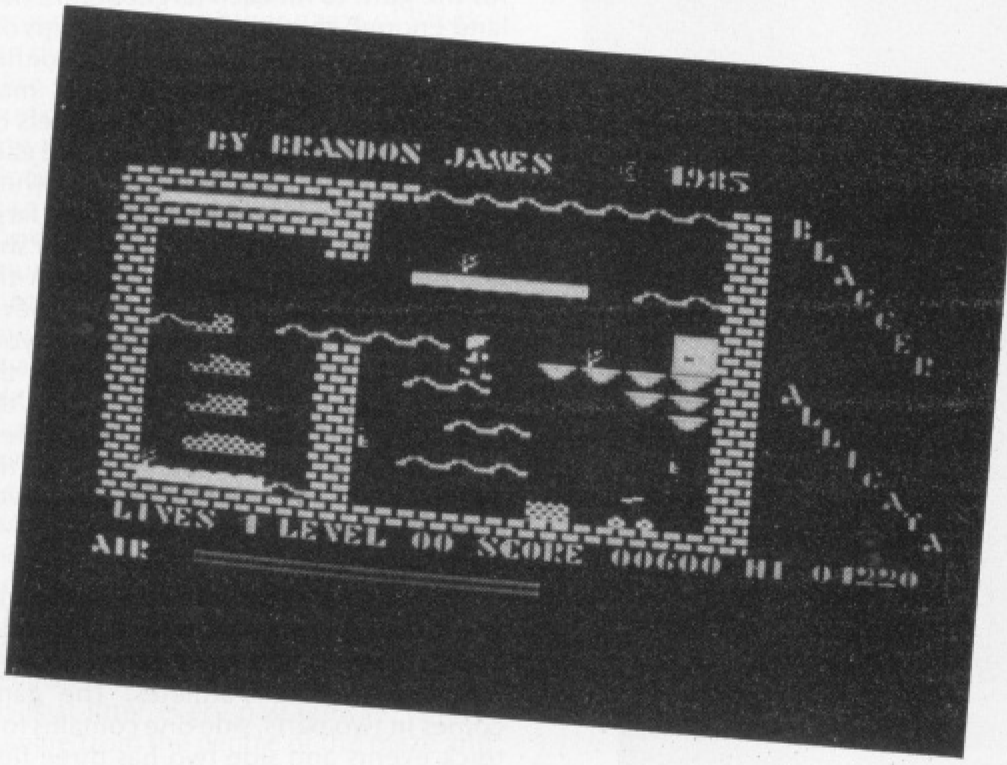
In glorious 3D graphics, your ship must bring down the enemy planes which zero in from the horizon and then bring the big guns to bear on the fleet of warships which block your way. In both cases it is essential to gauge the correct inclination for the guns to hit each target before they land enough shots to finish your ships off.

The final battle brings you in conflict with the enemy's largest and most accurate cannon. There are 10 targets on the fortress beneath the cannon and each target must be hit when it turns white. When all have been destroyed the large cannon begins to rotate towards your ship and you must score a direct hit on the weapon before it fires because it never misses. One hit destroys another of your ships so speed and accuracy is of the essence to succeed. This game lacks the addictive qualities of the others mentioned so far but the quality of the graphic displays is so cleverly achieved that it deserves a place in any C-16 collection.

Sports fanatics are also catered for with the C-16. Ocean has converted Daley Thompson's Star Events for the joystick waggling armchair athletes. The game comes in two parts, side one contains four track events and side two has three field competitions. The track events are the most frantic, partly because they last longer than the field events and therefore require a degree of stamina for success. The events comprise of the 100 metres, 110 metres hurdles, the gruelling 400 metres, with the 200 metres hurdles following close on its heels. The animated graphics are also cleverly done but this is not the sort of game where you spend your time admiring the scenery! Provision has not been made to carry your results through to the events on side two which is a pity. On my tape this side wouldn't load but I'll accept Ocean's word that the long jump, shot-put and javelin events are just as enjoyably challenging.

For sophistication I preferred Imagine's World Series Baseball. Not only do you get a 3D image of the diamond but there is also a giant video screen in the background which shows a close up view of the action.





Control is complex with all of the joystick positions having a bearing on various nuances of the gameplay. The animation is outstanding and with a little practice any novice can be hitting home runs, stealing bases and pitching fast balls with the best of them. Perhaps after learning the basics by playing this game, baseball could challenge American Football as a new spectator sport in this country.

So far none of these games has been particularly demanding on the old grey matter. Rushing in to fill this gap is an adventure game from Bug Byte.

Although Twin Kingdom Valley has been available for the C64 for quite some time now, this C-16 version is pretty new.

The game has been condensed by removing the graphics and some of the less important locations of the original. I've always felt that the graphics in an adventure limit a player's imagination (though I admit that this criticism is often cited in defence of radio drama over television!), so I'd rather play a complex text adventure than a limited multi-image game.

A nice touch is that the arrow and function keys are fully utilised to reduce the amount of typing necessary. The vocabulary is a little limited, action commands being selected from a list of 33 words. Not bad considering.

The idea is to wander about the Valley amassing as much treasure as possible. The pathways and caverns are patrolled by a variety of creatures who may turn out to be good or evil. As in life, the only way you can divide the wolves from the sheep is to cautiously try to befriend everyone you meet. Unlike life, if you die you can always try again.

There is no SAVE facility which means that you must start again each time you begin a session. This is a definite irritation but you can't have everything.

For me the ultimate brain stretcher is chess and my selection here would be Audiogenic's Grand Master. Playing against the computer is possible at a wide range of skill levels from novice to Grand Master.

The board is shown in plan view only and you can get the computer to suggest a move if you get really stuck. You can even leave the computer to play itself if you prefer but there isn't a two player option. This is true of most chess simulations based on the acceptable argument that the two player game is best played on a real board.

If the publicity blurb is to be believed, Grand Master claims to be the best chess game around. Whether you believe this or not is immaterial to me, whatever the truth my brain is well and truly taxed by this game. Well worth checking out.

The final game in this round up is by far the most impressive game I have seen on the C-16. ACE is a flight simulator (Air Combat Emulator) with stunningly fast-acting graphics.

As a fighter pilot, you find yourself already zipping through the ether at the beginning of the simulation. The control panel has all the necessary indicators to give you a fair chance to stay in the air and the radar displays the enemies' positions.

The aim is to seek out and destroy the enemy planes using the radar at first followed by visual tracking through the cockpit window. Trying to keep a plane in your sights as he dodges and fires at you is not very easy to do and low altitude aerobatics must only be indulged in by experts.

Full control over the jet is possible; climbing, diving, rolling and looping are all catered for and keeping track of the jet's orientation can be extremely difficult in the heat of battle. No collection can be considered complete without ACE.

It's not often that we have good news for Plus/4 owner's but Cascade have just brought out a specially expanded and improved version of ACE for these machines (reviewed in this issue of Your Commodore.). Buy it, it's money well spent.

Well that ends this little round up, next month I'll be looking at more serious applications software for the C-16. In the meantime why not drop me a line at the Your Commodore office telling me about you particular favourite game on the good old C-16. If enough people disagree with my selection I'll give your games a whizz and see if I agree. You can reach me care of Your Commodore, 1 Golden Square, London W1R 3AB.

YOUR COMMODORE

Lineage: 40p per word.
(46p incl. VAT).
Semi display: £9.00 per single column centimetre (plus VAT). Ring for information on series bookings/discounts.

All advertisements in this section must be prepaid.
Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request).

01-437 0699
EXT. 291

Send your requirements to:
STUART TAYLOR
ASP LTD, 1 GOLDEN SQUARE, LONDON W1

SOFTWARE

BANKER 64

If you are fed up not being able to keep track of your bank account this program may be just what you are looking for. Simple to use as it is menu driven it will hold full details of Credits, Debits, Standing orders and Direct Debits and will automatically place them in date order. It will give you statements to screen or printer including the 1520 plotter printer. Records can be stored on both disk and tape for complete back-up. Entry to any account is by name and Security code which can be changed as necessary. This m/c program is very good value at **£6.25 disk, £4.00 tape.**

RAMFILE

Keep track of your Software, Records, Stamp Collection, Addresses etc. with this easy to use menu driven filling system. Entry titles are user defineable. Powerful options include search and amend routines. Print routines allows printing of entry title, selected entry or complete file to any printer including the 1520 plotter. Files can be stored on both disk and tape.
This m/c program is very good value at **£6.25 disk, £4.00 tape.**

***Special Offer* — Both programs £10.Disk Both programs £7.00 Tape**
All prices include VAT P&P Cheques & P.O. to
RJP ELECTRONICS
27 Denham Way, Camber, Rye, East Sussex TN31 7XP Tel: (0797) 225549

CLAIRES COMPUTERS

TOP Software at **LOWEST** Prices.
Order two titles and you will receive a Top Class game **FREE**

	TAPE	DISK
Fight Night	£7.50	£10.50
Bounder	£6.95	
Revs	£9.95	£12.95
The Eidolon	£7.50	£10.99
Rambo	£7.50	
Commando	£7.50	
Yie Ar Kung Fu	£6.50	
They Sold A Million	£7.50	£10.50
Desert Fox	£7.50	£10.50
Winter Games	£7.50	£10.99
Little Computer People	£7.50	£10.50
Korinis Rift	£7.50	£10.50

Quick Shot II Joysticks Only £6.50
This is only a selection from our stock
Send now for latest list.
Send Cheque's P/O to
Claires Computers, 16 Treganoon Rd, Mount Ambrose, Redruth, Cornwall, TR15 1QZ
Tel 0209 211930 for your software needs

ALPHASOFT

CBM64 Software - 25% Reductions

Kung-Fu Master **£7.45**
Desert Fox **£7.45**
Spy Vs Spy II **£7.45**
The Eidolon **£7.45**
Merlenary **£7.45**
Comic Bakery **£6.90**
Yie Ar Kung Fu **£6.90**
Uridium **£6.90**
Ball Blazer **£7.50**
Bounder **£7.45**

AND MANY MORE!
Cheque/P.O. to **ALPHASOFT**
115 Parsonage Road, Withington, Manchester M20 9WZ
(List sent with order, P&P included)

SOCCER MANAGER — Manage your own team, 4 divisions, F.A. Cup, transfers tactics etc.
RACENIGHT — Run your own racenight, up to 10 players. Exciting horse racing game.
SOCCER QUIZ — Test your soccer knowledge, hundreds of questions.
Any one for **£3.99**, 2 for **£6.99**, 3 for **£8.50**
T. PALMER, 59, Old Park Road, Sheffield 8. Tel: 0742 749498.

EDUCATIONAL SOFTWARE

FRENCH REVISION
"La Conjugaison"

30 Regular Verbs. 17 Tenses for C.S.E., 'O', 'A' Level. As used in schools.
Commodore 64 Disk **£13.95** + 50p p&p.
ACCESS & CHEQUES WELCOME
Enquiries & Orders to:
MEDSTAT LTD, City House, Maid Marion Way, Nottingham NG1 6BH
Tel: 0602 411120

SOFTWARE GAMES

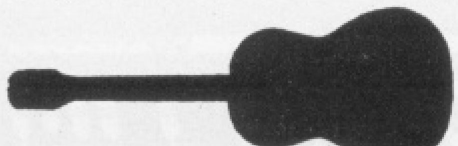
DERBY DAY - C16 Can you pick a winner in this Horse-Racing Spectacular? On Screen Action, visual form guide. Over 50 horses, thousands of race combinations. Realistic betting from different meetings. Plus many more features. Send £5.75. Cheque/PO to **BLOOMFIELD SOFTWARE**, P.O. Box 69, Blackpool FY2 9EX

QUIZ GAMES!
ON CASSETTE FOR C64

BLOCKBREAKER — **£4.45** — a quick thinking questions game. Win money, prizes and your opponent.
Extra questions available **£2.99**
TIMES UP — **£3.99** — Good with words? then you'll enjoy this one! Highest score challenges new opponent.
Add **50p** for p&p. Cheques/P.O. to:
GAMES MAKER
92, Robin Hood Lane, Hall Green, Birmingham B28 OJX
Tel: 021 745 3896

For details of advertising in Your Commodore Phone 01-437-0699

KNOCKDOWN PRICES
on
PLUS 4/C16 SOFTWARE
with over
125 TITLES TO CHOOSE FROM
DISCOUNTS FROM 10% - 50%
INCLUDING MANY OF THE LATEST TITLES
TO RECEIVE YOUR FREE LIST
SEND (A2) SAE TO:—
Venturegate Ltd (C16/PLUS4 Software List)
17 Harold Road, Leeds LS6 1PR, W. Yorkshire, England.



Now you can use your computer to help you learn or develop your skills on the guitar with GUITAR STUDIO, a range of essential software for guitarists.

* **Guitar Studio 1** - a tutor for beginners with or without a teacher. Creating a more musical environment encourages a more enjoyable and musical approach to learning while progressing at your own speed. Excellent for the guitarist who wishes to learn to read music.
* **Guitar Studio 2** - a chord dictionary with utilities. 500 chords, practice routines, melody input from manuscript or through the on-screen fretboard, develop your own chord sequences (even your own chords) through a simple programming facility. Play back with a wide choice of preset sounds. Full editing and filing facility.
* **Guitar Studio 3** - music theory for guitarists. Includes principles of notation, intervals, chord structures as applied to the guitar, scales, keys, etc. Tests are included enabling the user to monitor his/her progress.

TEACHERS - send for details if you want to interest your pupils in any of the above.

Price each - TAPE **£9.95**, DISK **£11.95**

Available through your nearest software dealer or direct from Micro Music. Trade enquiries welcome.

MICRO MUSIC
software for music education
St. Michael's Chambers
Spurriergate
York Y01 1QR
(Tel: (0904) 647588

WARNING NOTICE

Advertisements placed in this magazine are to be in strict compliance with our standard conditions (copies of which conditions are available on request) and on the clear understanding that the advertiser warrants that his advertisement(s) does not infringe any copyright or condition of sale of any interested party in the advertised product.

Further, the advertiser indemnifies the proprietors of this magazine in respect of costs, damages, or any other claims brought against them as a result of legal action arising from the publication of the advertisement.

Any breach of these terms or the said conditions may result in prosecution of the advertiser by the proprietors.

REPAIRS

TRIDENT ENTERPRISES LTD

Commodore 64 — **£15.** Vic 20 — **£12.50,** Spectrum — **£10.50,** QL — **£30,** 1541 Disk Drives — **£20,** and all Commodore systems. Send faulty machine with note describing fault to:

UNIT 7, WENTWORTH INDUSTRIAL COURT, GOODWIN ROAD, BRITWELL, SLOUGH TEL: 0753 21391

Overseas enquiries welcome. (Above prices are exclusive of parts and VAT).

COMMODORE REPAIRS

Commodore repairs by Commodore approved engineers. Repair prices: Vic 20 modulator **£8.05**, Vic 20 **£15.00**, CBM 64 from **£20.00**, C2N from **£9.00**, 1541 from **£20.00**, C64 psu **£13.50**, Spectrum **£16.50**, Dragon **£32.00**, Electrons, Atari. For more information SAE or telephone:

G.C. BUNCE & SON,
36 Burlington Road, Burnham,
Bucks SL1 7BQ.
Tel: (06286) 61696.
9am–6pm Mon–Fri.

The 1st choice EXPRESS COMMODORE REPAIRS!

WHY PAY HIGH 'FIXED' PRICES

Commodore repairs between £14 and £35.

1st

FOR PROFESSIONALISM – "Of all the repair companies 'Sinclair User' spoke to, **MANCOMP** seemed the MOST PROFESSIONAL when it came to advice and a helpful attitude" AUG 85.

WHY DELAY – OUR ESTIMATES ARE FREE AND WITHOUT OBLIGATION. IF YOU DO NOT LIKE OUR ESTIMATE WE WILL RETURN THE COMPUTER AND REFUND THE POSTAGE INCURRED!

MANCOMP LTD
(Dept YC5)
Printworks Lane, Levenshulme,
Manchester M19 3JP
OPEN MON - SAT 9am to 7pm
061 224 1888/9888

When replying to classified advertisements readers are recommended to take steps to protect their interest before sending money.

COMPUTER REPAIRS IN LONDON!

- Commodore, Spectrum, BBC, Atari, Amstrad etc.
- Low cost repairs from £12.00
- Collection & delivery optional

Call Nigel: 961 2812

ELECTRONIC SYSTEMS SERVICES
P.O. Box 443,
London NW10 8XB

GENERAL

BUY OR SELL your unwanted software, books, and hardware. We put you directly in contact with each other in your area. Details: Second Hand Computer Sales Agency. 38, Bowling Alley Walks, Dorchester, Dorset. Tel (0305) 64849 (24 hrs).

SOFTWARE

SOUTH EAST KENT SOFTWARE

Dept Y/C P.O. Box 152 Orpington, Kent

We stock for Spectrum, Amstrad, Commodore. Send S.A.E. for full list and prices. Please state which. Postage/Packing overseas £1.00.

COMMODORE 64 GAMES (TAPE)

	RRP	OUR PRICE
Commando	£9.95	£7.31
Beach Head II	£9.95	£6.75
Jeff Capes	£8.95	£6.65
Summer Games II	£9.95	£6.71
Transformers	£8.95	£6.65
Winter Games	£9.95	£7.31
Never Ending Story	£9.95	£6.51
Quick Shot II Joystick	£11.95	£7.95

And Many More Titles

Prices Now **Include** Postage/Packing

BUSINESS (DISK)

	RRP	OUR PRICE
Superscript	£69.95	£52.95
Superbase 64	£99.95	£68.00
Home Accounts	£24.95	£19.95

EDUCATION

English, Maths, German, French, History

RRP £9.95 **OUR PRICE £7.95**

Cheques/PO's payable to: **J. Ferguson**. Please allow 21 days delivery

FAST COMPUTER REPAIRS

VIDEO VAULT INTERNATIONAL

10★ REPAIR SERVICE

ACCESS WELCOME



COMMODORE 64 REPAIRED FOR ONLY **£35.00** including **POST & PACKING · PARTS · INSURANCE – NO HIDDEN EXTRAS!**

Are you fed up **waiting weeks** for your computer to be repaired well wait no longer. We repair all Commodores **same day**. We also do **Com 16, Vic 20, 1541 Disk Drives, plus 4**, or you can order the **Replacement Chips** from our D.I.Y. section.

- ★ While you wait repair service.
- ★ 3 month written guarantee on all repairs.
- ★ International Repair Company. We repair computers from all over the world.
- ★ All Computers sent Mail Order turned around in 24 hrs.
- ★ Most Commodores repaired within 1 hr.
- ★ All Micros insured for return journey.
- ★ Over 8 years experience working with computers.
- ★ All computers fully tested.
- ★ Power supplies fully tested.
- ★ RGB output fully tested.

N B WE DO NOT CHARGE AN AVERAGE PRICE

TRADE REPAIRS most welcome

BEST SERVICE – BEST PRICES!

TRADE SUPPLIED FROM STOCK!

ORDER NOW!

7 OPEN DAYS A WEEK

VideoVault D.I.Y. SECTION–

If you know what chip has gone in your computer you can order the replacement I.C. from our range.

6526	23.00	901225-01	23.00
6510	23.00	6569	23.00
6581	23.00	4164 RAMS	3.00
901227-03	23.00	Power Supply	
901226-01	23.00	Units	29.00

All prices include V.A.T.; please ADD £1.50 to cover P & P and handling costs, insurance.

VideoVault Ltd

Telephone: Glossop (STD 04574) 66555/67761
140 High St. West, Glossop, Derbyshire, England

FOR HIRE

MIDLAND COMPUTER LIBRARY
ATTENTION COMMODORE USERS
A SUBSIDIARY OF PLATINUM GOLD

† **OVER** 7,000 different titles available for hire for the **COMMODORE, SPECTRUM, ELECTRON, BBC, AMSTRAD, ATARI,** and **MSX computers.**
* **ARCADE, ADVENTURE, EDUCATIONAL** and **BUSINESS** software too.
* **HIRE PRICES** from only 75p **INC. P&P.**
* **20% DISCOUNT** off all purchase software.
* **FREE CATALOGUES.** * **FREE HINTS AND TIPS.**
* **FAST RETURN OF POST SERVICE** (if reserves are given).
* **ALL GAMES** manufactured **ORIGINALS** with full documentation.
* **OVER** 6,000 satisfied members. * **EUROPEAN** members welcome.
* **FREE MEMBERSHIP LIMITED PERIOD ONLY**
* Fully computerised system keeps track of your order. We pride ourselves in being the most professional Hire Library in the United Kingdom, with staff of 14 who knows what the word service means. Backed by our own software company and programmers.

VISA

MIDLAND COMPUTER LIBRARY
28 College Street, Worcester WR1 2LS. Tel: 0905 611072

Please rush me my catalogue, enclosing £1 to cover costs. Refundable on joining.

Name: ....

Address: ....

....

VIC-20/CBM-64 SOFTWARE HIRE

Free Membership. Hundreds of Titles to choose from. Send S.A.E. for your Free Hire Kit:

VSH (YM), PO BOX 65, NOTTINGHAM NG1

COMMODORE 64 cassette library. Hire latest games and educational software, only one price £1.50 per cassette 7 days hire. Details S.A.E. please: C.C.L., 19 Darrell Way, Abingdon, OX14 1HQ.

SOFTWARE APPLICATIONS

HOME ACCOUNTS

Put your house in order! Probably home computing's best use! Comprehensive coverage of bank accounts. Credit cards, HP in-built accuracy check. Records all transactions. Projects cash-flow for any period ahead. Available for Complete Commodore Range. £8.45 or *free* details from:

Discus Software
Freepost
Beach Approach
Brixham TQ5 8BR
Tel: 08045 55532

DISCS

!!! FREE DISKS !!!

For every 10 ordered we supply 11

5¼"
SS/DD **£10.99** SS/QD **£13.19**
DS/DD **£13.19** DS/QD **£15.39**

3½"
S/Side **£27.49** D/Side **£32.99**

All prices **INCLUDE VAT**
Delivery is **FREE**
All disks guaranteed for 12 months
Cash with order please to

HOLLBARN Ltd., Dept CM1,
8 Alexander Road, Stotfold,
Hitchin, Herts. SG5 4NA.

Promote your service on these pages every month at a cost effective rate.

HARDWARE

Super Breaker Back-Up Board

For the Commodore 64, CBM 128 and VIC-20. When a second CBM type cassette unit is connected to the board it will make security back-up copies of cassette based software, including Turbo/Fast Loaders, Basic and/or Machine Code and Data Files. No additional software is needed. Very User Friendly, the back-up copy is made on the second cassette while the original is loading on the first. Price at £8.95 Plus P&P.

RESET CARTRIDGE for CBM 64. This cartridge will reset all, yes all, memory resident programs. Including all programs where standard reset switches fail. Price £7.95 + P&P.

P&P 55p UK (Europe add £1.00, elsewhere add £2.00). Send cheque/postal order, or a stamp for details to:

C. Kent, 26 Northcape Walk,
Corby, Northants. NN18 9DQ.
For enquiries telephone (0536) 742622

FOR SALE

MOONRAKER £7.95

CBM64 Space Game features fast
***Fly-into Rolling Radar Display**
***Intra Red Target Screen**
Altitude, Time, Score Indicators,
Fuel/Purchase Option, Promotion.
Send your name, address & PO/cheque to:
J & J Gilmour Ltd.,
Dept YC486, 4 Copse Close, Liss,
Hampshire GU33 7EW, England.
Tel: 0730-893430.

HARDWARE

STAR SG-10C PRINTER

ONLY £249 TO INCLUDE VAT & NEXT DAY DELIVERY BY SECURICOR

★ 100% compatible with your Commodore computer.
★ 120cps draft mode.
★ Tractor and friction feed standard.
★ Near Letter Quality mode included.
★ 192 graphic mode characters.
★ 192 business mode characters.
★ 90 italic characters.
★ 90 NLQ characters.
★ Normal 80 cpl. Condensed 136 cpl.
★ Enlarged 2X, 3X & 4X.
★ Supplied with interface/cable and mains plug READY TO GO.

SEIKOSHA GP100 VC PRINTER £99

STRONG COMPUTER SYSTEMS

BRYNA COTTAGE, PENIEL, CARMARTHEN, DYFED SA32 7DJ C64
TEL: (0267) 231246 FOR ASSISTANCE!!!

★ BACK-UP-SYSTEMS FOR CBM-64 & VIC-20 ★

The BACK-UP-BOARD Mk. 1 is the fastest, and easiest way to back up your tape programs. With this board you can connect a second CBM cassette deck to your computer. You can copy a program on the second deck while the original loads from the first. You can back up all fast loaders, data files, etc. BACK-UP-BOARD Mk. 1 £10.00 inc. P&P.

BACK-UP-BOARD Mk. 2. This new version of our famous BACK-UP-BOARD is now proving so popular it is outselling our original Mk. 1. This new board now works two ways. Switched to 'NORMAL' it operates as the Mk. 1. Switched to 'GENERATE', '64' owners can use our special transfer software to regenerate a copy of a program on the second deck as it loads from the first. This method can produce a better quality copy than the original. BACK-UP-BOARD Mk. 2 & Software £14.50 inc. P&P. Conversion service. Return your Mk. 1 Board, if purchased from us, to be modified to Mk. 2 for £4.50 including software & P&P.

AZIMUTH HEAD ALIGNMENT TAPE by INTERCEPTOR for '64'. Use this test tape with your '64' to adjust the heads of your decks to make a perfectly matched pair. Full instructions and screwdriver supplied. £8.50 inc. P&P.

ROM SWITCH/RESET BOARD. Fit this board in the expansion port of your '64' and you can reset ALL programs. Resets programs that a standard reset switch can't. A socket for a 2764 8K eprom is also fitted. Full instructions supplied. £8.95 inc. P&P.

Please send SAE for more details of the above products. Send your cheque/PO to:

TURBOTRONIC
46 Ripon St., Parkinson Lane, Halifax, West Yorkshire HX1 3UG.
Tel: (0422) 52020
(Europe add 50p outside Europe add £1.50)

BOOKS AND PUBLICATIONS



We use only 10% of our mental potentials

Einstein

These are the words of Albert Einstein, the greatest physicist of recent times.

L. Ron Hubbard's discoveries in the field of the mind prove today that Einstein was right.

In his book "DIANETICS: The Modern Science of Mental Health" L. Ron Hubbard takes one more giant step in this direction.

He reveals how anyone can use his discoveries to isolate the exact barriers that have so far prevented people from using their mental potentials to the full.

More and more people from all walks of life including technicians, artists, GPs, scientists, workers and managers alike use Dianetics technology today.

The many written reports on their success are the best proof of the quality of this book.

Find our for yourself. Order your copy of this remarkable book today.

Price £3.95 paperback £17.50 hardback. Make cheques and POs payable to S.H.F. Send to Church of Scientology Saint Hill Foundation, FREEPOST (YC 5), East Grinstead, Sussex RH19 4ZA (no stamp required).

For advertising details phone Stuart Taylor on 01-437-0699

EPROMS

PROM-64

EPROM programmer for 8K, 16K, ZIF socket, Vpp generator & software on tape **£34.75**
64-CARTridge, 2 × 8K **£5.95**
DEMO EPROM 8K **£4.95**
DHOBI-2 EPROM eraser **£22.95**
UK + 15% VAT

Cambridge Microelectronics
One Milton Road, Cambridge
CB4 1UY
Tel: (0223) 314814 Tlx: 81574

SPORT

Horse form CBM 64/128 graphics/sound, printer/screen output, save-load race files, easy data entry. For the more discerning flat racing man. Horse form gives winners. **£7.95** cassette.

Cheque/PO to:

SEESAW SOFTWARE,
Box No. 212, YC Argus Specialist Publications, No. 1, Golden Square, London W1R 3AB.

FOR SALE

GADGET 64 £6.95

This 100% machine code CBM64 cassette utility offers: Append, Delete, Renumber (including Goto, Gosub, etc.) Satisfyingly simple to use. Send your Name, Address & PO or Cheque for £6.95 (P&P Free) to
J & J Gilmour Ltd.,
Dept YC486, 4 Copse Close, Liss,
Hampshire GU33 7EW, England.
Tel: 0730-893430.

SOFTWARE

C16/PLUS 4 SOFTWARE

Title	RRP	OUR
Commando	7.95	**6.75**
Games Designer	9.95	**8.50**
A.C.E. (C-16)	9.95	**8.50**
A.C.E. (Plus 4)	10.95	**9.40**
Airwolf	6.95	**5.95**
Steve Davis Snooker	7.95	**6.75**
Daley Thompson Star Events	6.95	**5.95**
Jump Jet	9.95	**8.50**
Games Pack I (15 games)	5.95	**4.95**
Games Pack II (15 games)	5.95	**4.95**
World Cup Football	6.95	**5.95**
Gullwing Falcon	6.95	**5.95**
The Boss	6.95	**5.95**
Anirog Favourite Four	7.95	**6.75**
C-16 Classics	9.95	**8.50**
C-16 Classics II	9.95	**8.50**
Gremlins	7.95	**6.75**
Spiderman/Hulk Pack	7.95	**6.75**
Atlantis	6.95	**5.95**
Grand Master Chess (C-16)	8.95	**7.75**
Grandmaster Chess (Plus 4)	8.95	**7.75**
Tom Thumb	6.95	**5.95**
Sword of Destiny	6.95	**5.95**
Xargons Revenge	6.95	**5.95**
World Series Baseball	7.95	**6.75**
Robcon Head Alignment	4.94	**4.50**

Title	RRP	OUR
Beach Head	7.95	**6.75**
Defence 16	7.95	**6.75**
Dark Tower	5.95	**4.95**
Wizard and Princess	5.95	**4.95**
Classic Adventure	5.95	**4.95**
Supergran	9.95	**8.50**
Canoe Slalom	6.95	**5.95**

BUDGET SOFTWARE

Mastertronic Titles (£1.99 each)
Formula 1 Simulator
Vegas Jackpot
Tutti Fruity
BMX Racers
Rockman
Squirm
Spectipede
Big Mac
Mr Puniverse

Buy any 3 for **£5.25**

Solar Titles (£2.99 each)
Knock-Out
Mission Mars
Suicide Run
Alien Attack
Cruncher
Quick Draw

Buy any 3 for **£7.95** or Buy any 2 for **£5.45**

C-16 JOYSTICK £9.95

Please state which micro.

All prices include postage and packing in the U.K.
Payment with order by cheque or postal order please to:

JOTHAN SOFTWARE (Dept Y.C.1)
65 Heol Gwys, Upper Cwmtwrch, Swansea SA9 2XQ. Tel: 0639-830934

FOR HIRE

HIRE HIRE

STAFFS COMPUTER LIBRARY

CBM 64 OWNERS

Join the friendly Library. We give you what you want. If a title is not on our list then we will get it, if it's still available. (Games only)

- All the latest Titles
- Full 7 Days Hire
- Low Hire Cost. From 75p
- Up to 4 Games per week
- All games original
- Lots of American Titles
- Low Hard and Software prices
- Membership ONLY £5.00

Free m/c Monitor on joining

Send your cheques/postal orders payable to:

STAFF COMPUTERS
The Newlands, Greensome Lane, Stafford

YOUR COMMODORE CLASSIFIED ORDER FORM

1.	2.	3.
4.	5.	6.
7.	8.	9.
10.	11.	12.
13.	14.	15.

Please place my advert in YC for. ...... **issues** commencing as soon as possible. I am enclosing my cheque/P.O. for £. .... (made payable to **A.S.P. LTD**) **(46p per word VAT INCLUSIVE.)**

Name ....

Address ....

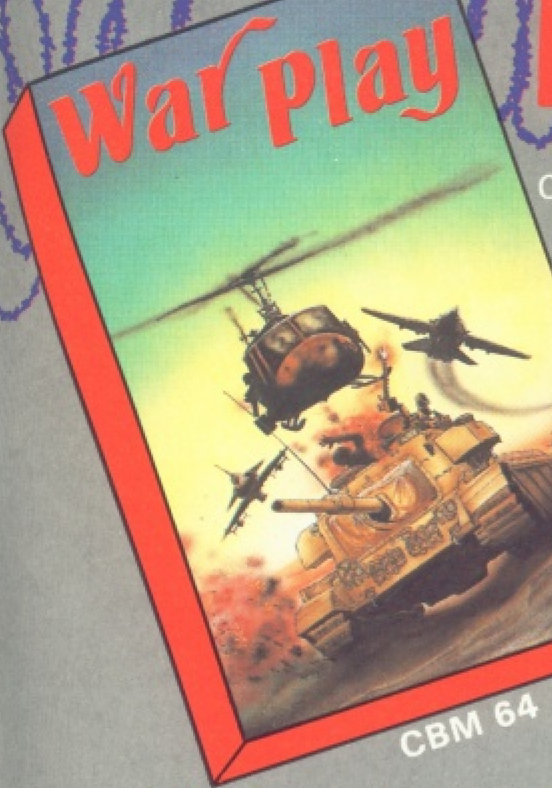
....

....

Phone No. ....

Signature .... **Date** ....

SEND TO: STUART TAYLOR, ASP LTD
1 GOLDEN SQUARE, LONDON W1R



WAR PLAY

Choose your weapons - choose your role. Whose air force will do the victory roll? Whose commander will surrender?

Aerial dog-fights - Tank battles - an elusive commander - The scene is set for a thrilling contest of skill and strategy. One or two player.

£7.95 Cassette
£10.95 Disc



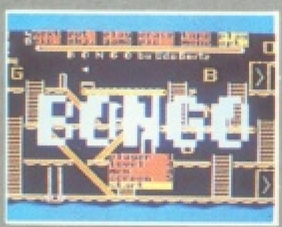
CBM 64

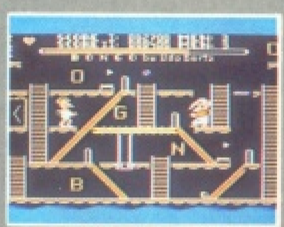
CBM 64

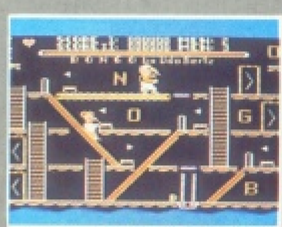
C16/PLUS 4 COMES OF AGE!

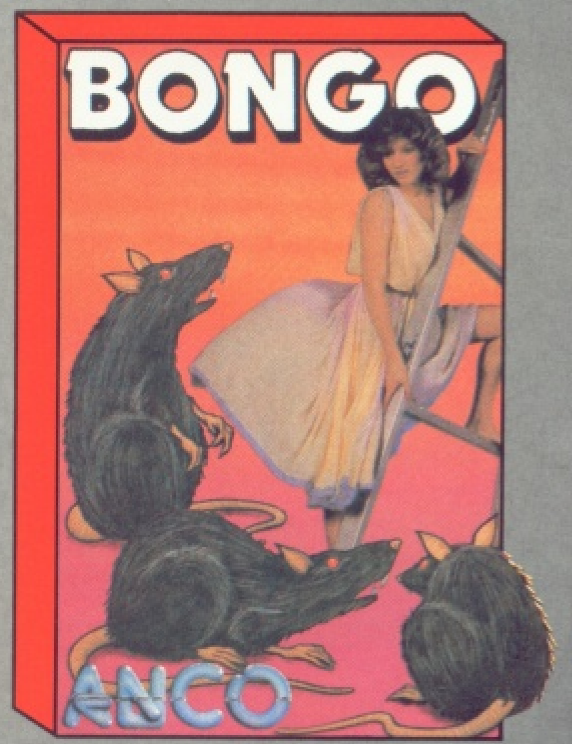
BONGO **C16/PLUS 4** **£5.95 Cassette**

64 quality graphics and music - 6 high res. graphic screens - 5 skill levels - Menu driven facility to construct your own screens with save/load facility.

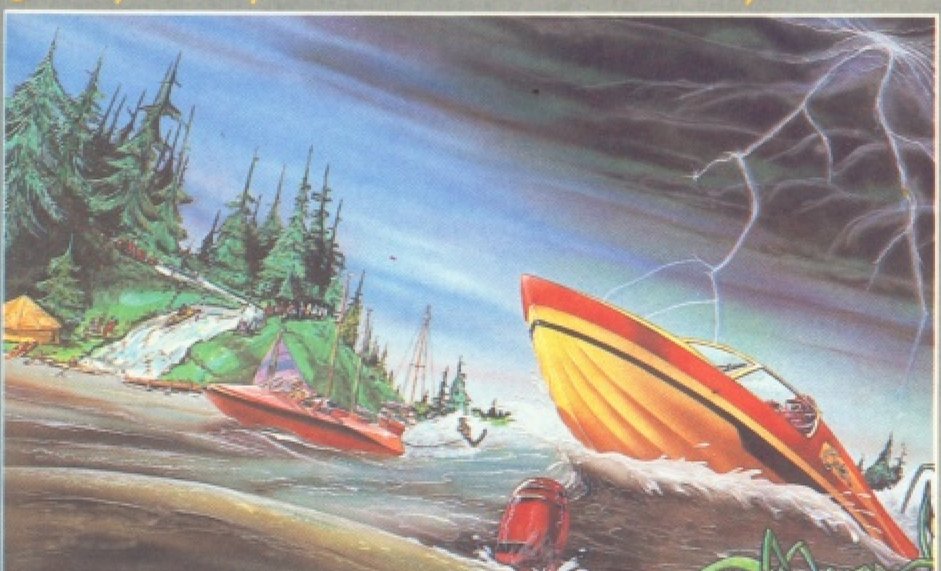




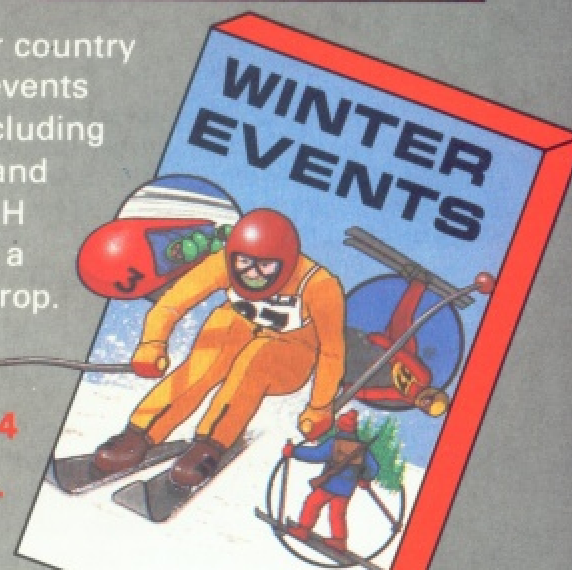




Championship Series *Ultimate in sports simulations.*



Represent your country in six star events competition including BIATHLON and BOB SLEIGH set against a scenic backdrop.



C16/PLUS 4

£6.95 Cass.

C16/PLUS 4 **WATER SPORTS** **£6.95 Cass.**

Experience the sheer exhilaration of POWER BOAT RACING - Negotiate a complex SLALOM COURSE - Rise to the challenge of a SKI JUMP. Three exciting competitive events. **ENHANCED PLUS 4 FEATURES**

COMING SOON IN THE — *Championship Series* — TENNIS - CHESS - ICE HOCKEY

ANCO

TRADE ENQUIRIES:
ANCO MARKETING LTD., 85, TILE KILN LANE, BEXLEY, KENT.
TEL: 0322 522631
MAIL ORDER: PAYMENT BY CHEQUE, P.O., VISA OR ACCESS
24 HR CREDIT CARD SERVICE

Choosing the right computer is a good start — but can you find the right software?



At SUPERSOFT we're very conscious of the fact that people who spend several hundred pounds on computer equipment are looking to do rather more than play Space Invaders.

Financial planning is a rather grand name for something you've been doing all your life – making ends meet! Perhaps if Mr Micawber had used **BUSICALC** he would have been able to balance the books a little better.

For home, club or small business use BUSICALC 1 should pay for itself in no time at all; for larger companies we recommend BUSICALC 3, one of the few really valuable programs that you can learn to use in a day.

Although your Commodore 64 is a powerful musical instrument you need to be a pretty good programmer to understand how it all works. Unless, of course, you buy **MUSIC MASTER!**

To use MUSIC MASTER requires no prior musical knowledge, though in the hands of an experienced musician it will prove an invaluable tool. You don't need to know the first thing about programming either! MUSIC MASTER is the musical equivalent of a word processor, remembering the notes you play and allowing you to replay and edit them as you wish.

INTERDICTOR PILOT is a space flight simulator. Nowadays simulators are widely used to train pilots and astronauts because – to be frank – it's a lot cheaper (and safer) than the real thing!

Imagine, if you will, life in the 22nd century: space travel is commonplace, and on the outskirts of the galaxy the first war between civilizations is being fought. A shortage of trained pilots has prompted the Federation to develop a computer simulation that allows raw recruits to gain experience without paying for their mistakes with their lives. With the aid of your Commodore 64 you too can learn to pilot the Interdictor Mk 3 craft. But be warned – this is no game!

SUPERSOFT

SUPERSOFT, Winchester House, Canning Road, Wealdstone, Harrow, Middlesex HA3 7SJ
Telephone: 01-861 1166

Other SUPERSOFT products include the **MIKRO ASSEMBLER** cartridge, the only assembler that's ideal for beginners yet powerful enough for the professional (most of our competitors use it!). The **VICTREE** cartridge adds dozens of commands to Basic including toolkit aids and disk commands; or on disk there's **MASTER 64,** a really comprehensive package for the keen programmer.

Of course, we do also publish games programs, and with classics like **STIX, QUINX** and **KAMI-KAZE** in our range we are one of the market leaders. But we most enjoy coming up with the sort of programs that are going to be in use for months and years, not hours and days – the sort of programs that make you glad that you bought a computer – and glad that you bought SUPERSOFT!

You won't find SUPERSOFT products on the shelves of your local supermarket. But most specialist shops stock titles from our extensive range (and are prepared to obtain other programs to order). However you can also buy direct by sending a cheque (pre-paid orders are post free!), by calling at our offices, or over the telephone using your ACCESS card.